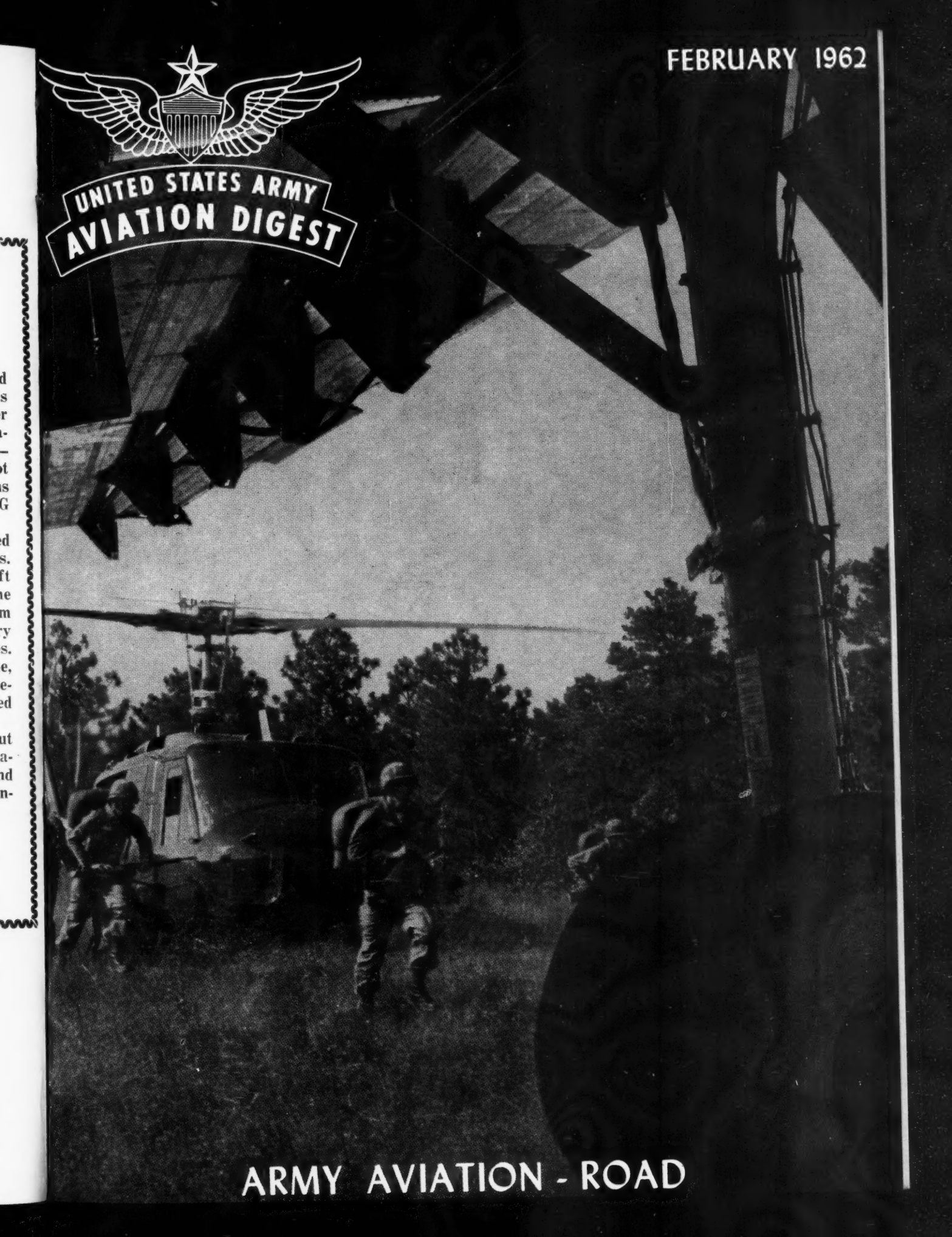
UNITED STATES ARMY
AVIATION DIGEST
FEBRUARY 1962
ARMY AVIATION - ROAD

United States Army

AVIATION DIGEST

FEBRUARY 1962 VOLUME 8 NUMBER 2

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FROM THE DESK OF GRASSHOPPER GUS . . . . . Inside Back

Taxi accidents alone cost the Army a half million dollars during FY 1961—and this does not include ground handling accidents in which the aircraft was not started for the purpose of flight. In recent weeks several more ground handling accidents have occurred. Ground handling and taxiing procedures should be carefully reviewed with a view of precluding this type of accident and the unnecessary loss or damage of critical assets. As a well known comedienne says, "WATCH IT!"

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

Manuscripts, photographs, and other illustrations pertaining to the above subjects of interest to personnel concerned with Army Aviation are invited. Direct communication is authorized to: Editor-in-Chief U. S. ARMY AVIATION DIGEST, U. S. Army Aviation School, Fort Rucker, Alabama.

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Army Aviation and the Reorganized Army Division

Lieutenant Colonel Morris G. Rawlings, Arty

ON 25 May 1961, the President of the United States directed the reorganization of the Army's divisions. Highly classified plans, prepared in anticipation of such a reorganization, were declassified and their implementation undertaken.

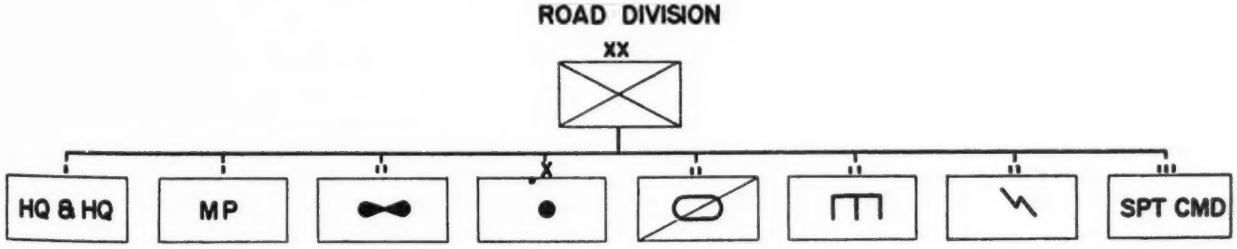
Since World War II, the Army has gone through several conceptual reorganizations to keep pace with technological advances and the changing political situation. One of these concepts became a reality in the form of the ROCAD (Reorganization of the Current Armored Division), ROCID (Reorganization of the Current Infantry Division), ROTAD (Reorganization of the Airborne Division).

The latest concept currently called ROAD (Reorganization Objectives Army Divisions) is expected to begin phase-in during early calendar year 1962. Reorganization in the National Guard and Army Reserve will be concurrent with the Active Army, although stretched out over a longer period.

The unique feature of the ROAD Army divisions is that each type, armored, infantry, airborne, and mechanized, has a common base utilizing the building block principle. In other words, the common division base (see fig. 1) contains the **control** element in the form of its headquarters and those of the three brigades: **combat forces** including divarty and the reconnaissance battalion; **combat support** composed of the aviation, engineer and signal battalions; and the **support element,** the support com-

Col Rawlings is Director, Combat Developments Office, Fort Rucker, Ala.

Figure 1



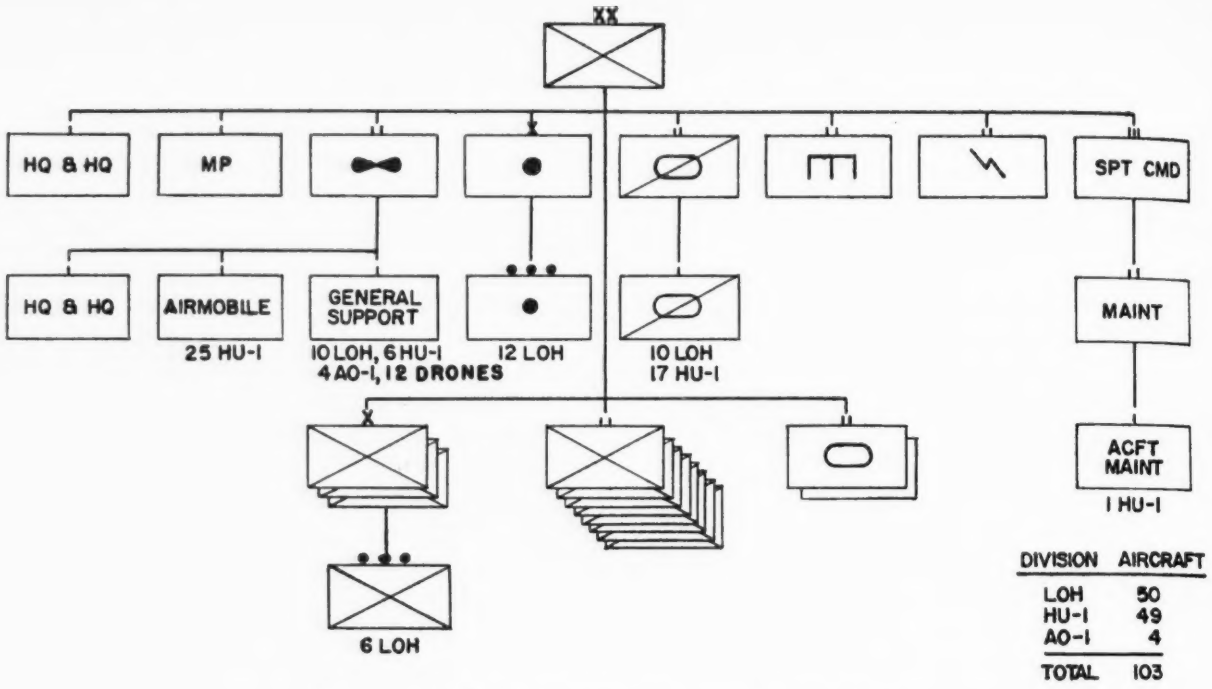


Figure 2. ROAD division with aviation breakout

mand with its administrative, medical, supply, and maintenance units. With this common base combat battalions can be added or subtracted, tailoring the division to best accomplish its mission.

For "normal" operations, the optimum armored division contains six tank battalions and five mechanized battalions; the infantry division, eight infantry and two tank battalions; the mechanized division, seven mechanized and three tank battalions; and the airborne division, nine airborne infantry and one assault gun battalion. As can be readily seen, the ratio of type battalions can be readily changed or the number of battalions switched in accordance with the assigned mission.

By minor modification of the common division base, subtraction of one type battalion and addition of another type, a division in a field army can be changed overnight from one type to another—from mechanized to armored, for instance. Likewise, whole battalions can be replaced rather than be reconstituted on the battlefield. This system effectively uses large numbers of separate battalions. This is the environment surrounding the Army Aviation of the Armored, Infantry, Airborne, and Mechanized Divisions. (See fig. 2.)

The Army Aviation Battalion, TOE 1-75E, consists of a Headquarters and Headquarters Company, an Aviation Company (General Support), and an Airmobile Company (Light). The manpower of this battalion is 51 officers, 26 warrant officers, and 373 enlisted men. Battalion headquarters is similar in grade and structure to that of a line battalion, with the addition of a major who is the assistant division aviation officer.

The battalion mission is to provide aviation support for division headquarters, division support command, and other divisional units which do not have organic aircraft. It also provides general support and reinforcement to units possessing organic aircraft. The battalion staff supplements the division special staff section.

The Airborne Division Aviation Battalion differs slightly in organization from the others in that an FOC (Flight Operations Center) is provided for operations outside of the field army or corps air traffic system, and it does not contain the normal drone section.

Headquarters and Headquarters Company (TOE 1-76E), with 13 officers, 1 warrant officer, and 62 enlisted men, includes a battalion headquarters, company headquarters, and communications, maintenance, and medical sections.

The Aviation Company (General Support) (TOE 1-78E), commanded by a major, has 26 officers, 6 warrants, and 125 enlisted men. It has a general support, an aerial surveillance, and a service platoon. In the general support platoon is found a tactical support section with 10 LOH and a utility section with 6 HU-1Bs. In the aerial surveillance platoon, the aerial radar section has two AO-1 aircraft; the aerial infrared section two AO-1s; and the drone section, a system of 12 drones. The service platoon has the maintenance for aircraft, drones, and communications, as well as airfield service. No aircraft are assigned to this platoon.

In addition to providing general aviation support to the division, the GS Company also furnishes medium range aerial surveillance to acquire combat intelligence and target acquisition information required by the division. The company is capable of continuous (day and night) operations during VFR conditions and limited IFR operations; aerial observation, reconnaissance and surveillance (day and night) of enemy areas to locate, verify and evaluate targets; terrain study and fire adjustment; piloted and drone aircraft day and night photography; radar and infrared surveillance; battlefield illumination; radiological survey; aerial transportation for command control, liaison, reconnaissance, or communication; and limited aeromedical evacuation.

The Airmobile Company (TOE 1-77E), which, together with the General Support Company, represents the major operational units of the Aviation Battalion, contains 13 officers, 19 warrant officers, and 86 enlisted men. Like the General Support Company, it is commanded by a major. Components of this company are company headquarters, three airlift platoons, and a service platoon.

Like the battalion and GS Company headquarters, the Airmobile Company headquarters has no assigned aircraft. The company's 25 HU-1s, which will hopefully be the D model, are in the three airlift platoons, with one in the service platoon. This one service platoon aircraft is primarily for emergency transport of critical parts and maintenance personnel. Each of the three airlift platoons is subdivided into two airlift sections of four aircraft each for more effective control. Each airlift platoon is commanded by a rotary wing instrument examiner, somewhat of a rarity today.

The mission of this Airmobile Company is threefold: It provides tactical air movement of combat troops in the division area to include vertical envelopment of the enemy; tactical air movement of combat supplies and equipment within the division area; and supplemental aerial firepower for maneuver elements of the division. It has the capability of lifting the assault elements of one infantry or dismounted mechanized company simultaneously and of delivering heavy aerial fire support.

The Aviation Battalion has less than 45 percent of the aircraft assigned to the division. The remainder, scattered throughout subordinate units (fig. 3), have varying missions assigned by the headquarters to which they belong. The Air Cavalry Troop, a part of the Reconnaissance Squadron (fig. 1) is assigned three missions:

- Perform aerial and ground reconnaissance as well as security for the unit to which they are assigned or attached.
- Engage in offensive, defensive, or delaying actions.
- Conduct independent operation when properly reinforced.

Other aviation, Artillery, Infantry, and the single aircraft of the Support Group, are used to assist the senior headquarters in the accomplishment of their mission.

Numbers of aircraft appear firm, although types may change before implementation is complete. A specific example is the Artillery section, where the twelve aircraft may well be ten LOH and two fixed wing craft capable of longer-ranged target acquisition.

Under the new divisional concept, all elements of the division fall generally into neat niches labeled **control, combat, combat support,** and **support.** An attempt has been made to label divisional Army Aviation in a parallel manner (see fig. 4). The difficulty herein is that certain aviation units have a dual role, and they seldom can be tied to a single effort.

Figure 3

TYPE	AVN BN	BRIGADE	RECON	DIVARTY	D/S MAINT CO	TOTAL
LOH	10	18 (6 ea)	14	12	—	54
HU-1	31	—	13	—	1	45
AO-1	4	—	—	—	—	4
TOTAL	45	18	27	12	1	103

DIVISION ARMY AVIATION ORGANIZATION FOR COMBAT

CONTROL	COMBAT	COMBAT SUPPORT	SUPPORT
Avn Bn Hq			
GS Co Hq	Aerial Surv Plat	General Support Plat	Service Plat
Airmobile Co Hq	Airlift Plat	Airlift Plat	Service Plat
Brigade Hq		Aviation Section 6 LOH	
Div Arty		Avn Section 12 LOH	
Recon Bn			
Air Cav Tp Hq	Aero Scout Plat Aero Rifle Plat Aero Wpns Plat		Service Plat
Support Comd Maint Bn			Acft Maint Co

Figure 4

By considering divisional Army Aviation as a single entity, we can show that the aviation command and control element of the new division includes the aviation battalion headquarters with its subordinate general support and airmobile company headquarters; the division aviation staff; the brigades' headquarters controlling an organic aviation section of six LOHs; division artillery, controlling an aviation section of 12 machines; reconnaissance squadron and air cavalry troop headquarters controlling the air cavalry troop; and the support command maintenance battalion controlling the aircraft maintenance company.

The combat elements of division aviation consist of the aeroscout, aerorifle, and aeroweapons platoons of the air cavalry troop; the aerial surveillance platoon of the General Support Company; and the airlift platoons of the Airmobile Company. The fighting elements of the air cavalry troop are unquestionably part of the combat element; however, the airlift platoons enjoy a dual role. When used as a base of fire for a maneuver force, to include a maneuver force carried within the aircraft, this unit must be classed with the combat element just as is division artillery. Unarmed they are trucks on an aerial highway, and serve to support.

The aerial surveillance platoon of the General Support Company extends the division's intelligence area beyond that of any other intelligence means in the division. All of its functions are tactical even though all the aircraft within this unit may not be armed. To make this statement more positive, let us say certain aircraft may be armed to accomplish their mission.

The combat support element includes those units whose primary function is one step removed from direct engagement with the enemy, such as the engineers who build bridges and roads and the signal battalion which provides the communications. Consequently, in aviation, combat support is represented by the general support platoon of the General Support Company, the brigade aviation section, the division artillery aviation section, and the unarmed airlift platoons of the Airmobile Company.

Under the support element are all of the aviation units performing maintenance, service, and supply. This includes the service platoons of the General Support Company, Airmobile Company, Air Cavalry Troop, and the Aircraft Maintenance Company of the Support Command.

The Army Aviation of the ROAD divisions has been reorganized to properly augment the capability of the ground forces to conduct land warfare. In keeping with the guidelines established for Army Aviation, great strides have been taken toward the goal of optimum support.

- The increase in aircraft has been accomplished by a decrease in centralization.
- Aircraft armament is no longer the dream of visionaries, but nears a routine application.
- Third echelon maintenance has become organic to the division.
- Air transportability is available within the division's resources.

Prepared also are the necessary training programs, training tests, and applicable field manual guidance.

Aviation is on the ROAD!

Right Is Left

Captain A. A. Bezreh, MC

A LITTLE KNOWN poet once said, "Right is right, and left is left; and ne'er the twain shall meet." An interesting case history has come to the attention of USABAAR fairly recently, a case history which is so pregnant with possibilities for speculation and preaching that it was impossible to resist the opportunity.

The first accident experienced by this Army Aviator occurred during the landing of an L-19 on a dirt road. After a three-point landing, the aircraft bounced slightly and rolled straight ahead for approximately 150 feet. Then the left wing rose and the aircraft turned about 5° to the right. To

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Capt Bezreh is a graduate of the Flight Surgeon's Course at Brooks Air Force Base and is a member of the staff, Human Factors Section, USABAAR.

control this incipient groundloop to the right, the aviator stated that he applied left rudder and brake, and pushed the throttle to the firewall. A quartering crosswind should also have helped the aircraft turn to the left.

However, the effects of left rudder and brake, the effect of the torque of the engine to the left, and the effect of this crosswind did not stop the plane from continuing to veer to the right off the road and into a ditch. The aviator had made a 360° turn to the right before making the landing to ensure that no traffic was on or approaching the road strip. The investigation board considered the accident to be just another groundloop, and it certainly would not seem justifiable to draw exotic conclusions from a type of accident so common in the L-19.

One month after this L-19 accident, the aviator experienced an incident in an L-23. The aviator believed that he had lost the left engine, and feathered it. After making a 90° turn at normal airspeed and finding that he could maintain directional control, he took number one engine out of feather, held airspeed and made turns to the right and left. He thought that he had a rudder failure, because his right rudder control did not respond properly. He called the tower for a right base, but could not turn to the right on final. He then added power on the left engine and made a go-around to the left. After retarding both engines, he touched down straight ahead. The aircraft turned to the left and skidded into the mud.

The pilot stated afterward that he had used right brake, but the investigation revealed that the **left** tire showed evidence of strong braking action. Examination of the aircraft showed that there was apparently nothing mechanically out of order. During the checkride following the incident, the aviator was observed to reach for the wrong prop control lever, although he did catch himself and use the correct control.

If, giving the aviator the benefit of all doubts, he had actually experienced a loss of power in his left engine, the cause of which might not be detectable during the investigation, then he certainly did not follow proper single engine procedure in his ensuing actions. There are many possible ways in which to interpret this sketchy account. But, in the light of what was learned from this aviator's second L-23 mishap, it seems most likely that airspeed was allowed to fall to a point at which directional control, with the left engine not developing as much power as the right, was lost during the attempted approach and landing.

Whether this supposed inequality of power outputs resulted from an actual malfunction in the left engine or from improper power settings on the part of the aviator is just guesswork, as is this whole attempt at analysis. However, with inadequate airspeed, such an unbalance of power output could have caused the aviator difficulty in turning right base and could have caused him to swerve to the left when he finally did manage to touch down.

It is interesting to note that the aviator used the wrong brake during the landing; but it is probably not correct to attach too much significance to his reaching for the wrong prop control lever during the ensuing checkride. Both of these bits of evidence, taken together with the events of the first accident, suggest the idea that this aviator may be subject to psychomotor reversal during periods of panic or stress, a condition not helped at all by a lack of proficiency in emergency procedures.

The third chapter in this story occurred about one year later. The aviator made several 360° turns while descending 5,000 feet to an altitude of 1,000 feet above the ground to perform a tracking mission in an L-23. After reaching his desired altitude, he began to notice that he seemed to need increasing amounts of right rudder to keep the aircraft from turning to the left.

Eventually, full right rudder and full right aileron were not sufficient to keep the aircraft from turning to the left, and the L-23 began to lose altitude. The aviator checked his fuel gauges and found that they were all in the green. The fuel tanks were switched and the boost pumps turned on. Then the props were run up to 3200 rpm and the throttles advanced to 45 inches.

The aviator advised another L-23 in the area that he had lost an engine but he felt that he could handle the situation. He thought that the left engine was malfunctioning and, therefore, pulled the left mixture control to idle cut-off and feathered the left engine. He stated later that he observed the left propeller go into the full feather position, but that it continued to turn at a slow rpm.

The aircraft continued turning to the left and losing altitude. Reduction of power on

the right engine would decrease the rate of turn to the left, but increase the rate of descent. Reducing pressure on the right rudder would momentarily lessen the rate of turn, but after several seconds the original rate of turn would resume. It soon became apparent that a forced landing was inevitable and after an approximately 425° slow left turn, the aircraft crashed in a left wing-low attitude. Moments after the pilot exited from the cockpit, practically unharmed, the plane burst into flames and became a total loss.

Examination of the wreckage revealed that neither propeller was in a feathered position at the time of the crash. Furthermore, there was no evidence of anything wrong with either engine prior to impact. Finally, there was no indication of any control malfunction, as far as could be determined.

It may be that this aviator was the unfortunate victim in two similar sets of circumstances, which our present investigation techniques are incapable of detecting and defining. However, in reviewing these events, many possibilities, other than bad luck, must be considered, if only for the sake of doing a thorough job of evaluation. Perhaps more profitably these accidents can be used as a vehicle for discussing some points of interest.

As the result of a neuropsychiatric evaluation after the last accident, the only diagnosis made on this aviator was that he had a slow reaction time in emergency situations. It was pointed out that the deliberate consideration with which the pilot responded to a situation was probably as much of an asset as a liability.

This may be true, but only if proficiency in emergency procedures is maintained. Certainly, it is desirable for a pilot to assess as accurately as possible the nature of his emergency so he can make the correct response. However, experience has shown definite sets of procedures should be used in response to certain emergency situations. The aviator should be proficient in them at all times.

During two checkrides after the last accident this aviator was given emergencies requiring single engine procedures. On both occasions his responses were so slow, because of lack of familiarity with proper procedures, that airspeed was allowed to fall dangerously close to the minimum consistent with single engine capability. When the pilot noticed loss of altitude, he pulled back on the stick, further increasing his loss of airspeed.

It is very possible that just such responses in the two L-23 experiences may have placed the aircraft at airspeeds below their single engine capability, at which time loss in altitude and gradual, uncontrollable turns to the left were experienced. After reviewing accidents such as these, one is forced to wonder whether the procedures and requirements which the Army is using for the evaluation and maintenance of the proficiency of the pilots in the field are adequate. One also wonders why a mature individual would put himself in a dangerous situation because of lack of skill and knowledge. A little self-examination and appropriate effort would improve his chances for surviving such situations or obviate them as threats to his life altogether, particularly after the forewarning of a significant close call. Finally, one wonders if the Army has set up adequate machinery for the evaluation of pilots with multiple accident histories.

Reference has already been made that a process of psychomotor reversal suggests itself in these accidents because of the frequent confusion of right for left in responses and results. An interesting note: this aviator at times flew the L-23 while sitting in the left side pilot's seat with his left foot on the left rudder pedal and with his right foot on the copilot's right rudder pedal. He did this because he was a tall individual with long legs, and this position afforded him a chance to stretch a little.

Aside from the lack of advisability on general principles of such a way of flying, there is a possibility that the two L-23 experiences may have been causally related to such positioning. If during a stressful situation, the pilot unknowingly had his right foot on the left rudder pedal on the copilot's side, the results could have been confusing indeed.

This postulated mistaken positioning of the feet could explain how, during the first L-23 incident, the pilot thought that he had applied right brake to correct for the swerve to the left, while the investigation revealed that in reality there had been strong left braking action. This postulated positioning of the feet also could help to explain why during both L-23 experiences there was so much difficulty in keeping from turning to the left, since both feet would be applying left rudder. The role which unorthodox positioning plays in accident causation would be extremely interesting to know, but this

type of information is often very difficult to uncover.

While all of these unlikely and highly speculative possibilities, which are completely incapable of substantiation, are being considered, the mechanisms of vestibular or proprioceptive misinformation must be mentioned. It happens that the groundloop in the L-19 was preceded by a 360° reconnaissance turn; and the gradual descending left turn which resulted in the crash of the L-23 was preceded by several descending 360° turns.

Whether such turns preceded the first L-23 incident is unknown. Usually, such wide and gradual turns in these aircraft do not produce vestibular or proprioceptive disorientation. However, there appears to be such an entity as subclinical vestibular pathology. Pilots with such a condition can become disoriented by such minimal physiological stimulations as are produced even by slow turns.

Such a condition would exist, for example, when the semicircular canals in the inner ear are not equally sensitive to any given turning stimulation on the right and on the left. If the vestibular apparatus in the left ear is more sensitive to stimulation resulting from a turn than is the vestibular apparatus on the right, then there will be an imbalance of orientation information input from the two labyrinths into the brain. The brain will then think that the body is turning to the left, even if the body is moving straight and level, after having come out of a turn.

This tendency to vestibular disorientation is not always detectable by ordinary clinical means. It is often only in flight, when the other means of orientation, such as vision and proprioception, are sometimes rendered unreliable, that this misinformation or imbalance of information from the two inner ears can actually produce disorientation.

When people with such a condition are on the ground, the correct orientation information, which they get from vision and proprioception, overrides the misinformation from the diseased vestibular apparatus and disorientation is not experienced. Thus, for an individual whose semicircular canals produce unequal intensities of orientation information on the right and left sides, an aircraft maneuver which ordinarily would not produce vestibular disorientation might do so.

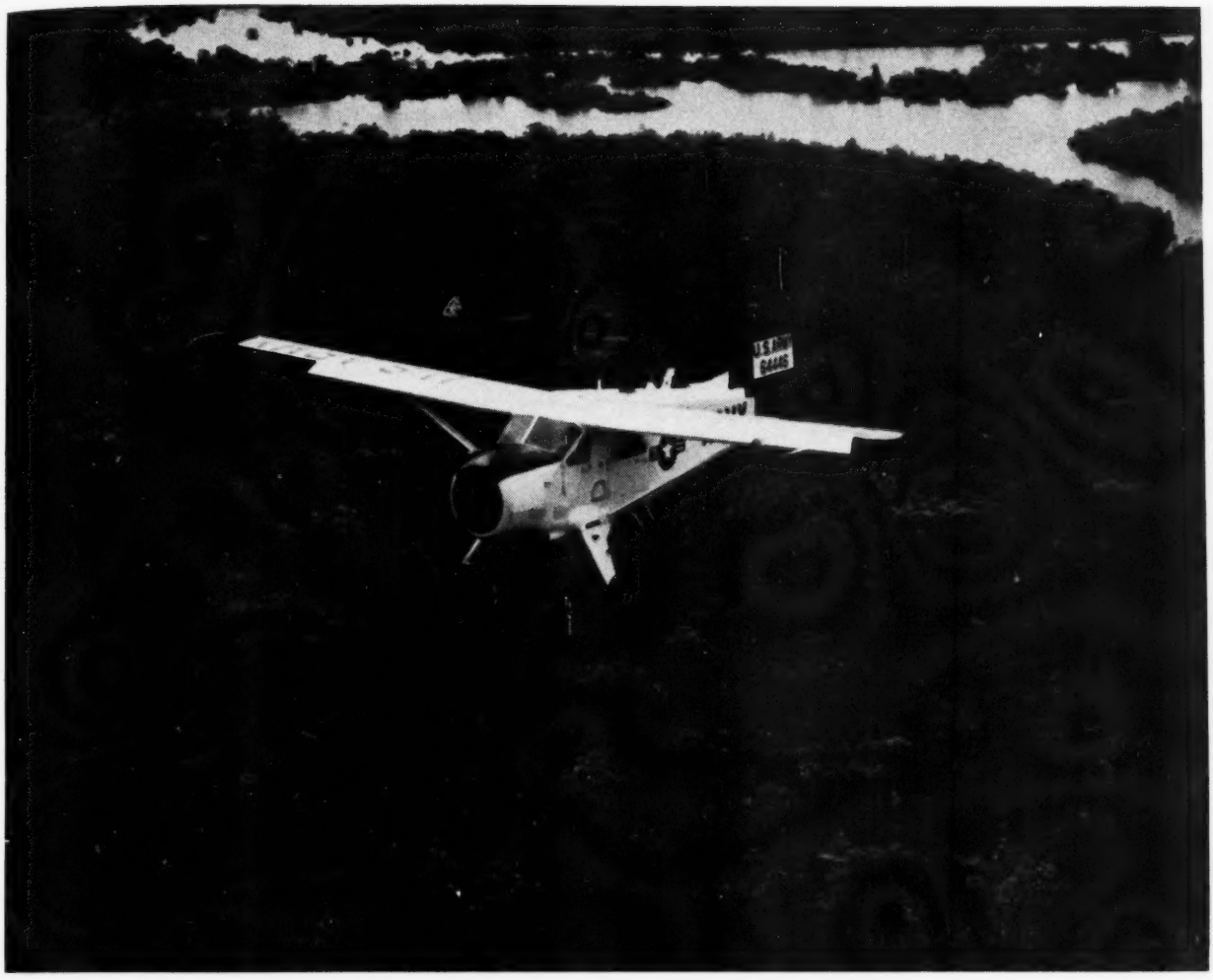
The striking inconsistency between what the aviator said happened and what the investigations revealed to have happened in the two L-23 experiences suggests that the aviator for any of several possible reasons could not recall or relate accurately what did happen. We know that panic can interfere with both perception and response. We know that anxiety or guilt feelings associated with an event can interfere with recall through the mechanism of repression.

It is not unusual under stress to confuse what we did with what we planned to do. Therefore, in an accident involving a problem such as this, it may be worthwhile to consider the use of sodium amytal, or some such drug with a hypnotic effect, to help resolve the inconsistencies. This is a completely sanctioned technique.

Aviators should realize that the drug is not used to determine whether anyone is lying about the accident, but that it is used to determine whether some subconscious psychological mechanism is interfering with the recall of the accident events. Experience has taught that, if such a technique is not used, in some cases valuable information which could have contributed significantly to accident prevention will be allowed to slip through our fingers.

At this point, it should be all too apparent that the processes of accident analysis and prevention involve many approaches and disciplines, from the most direct to the most oblique approaches, from hardheaded practicality to fortune teller's guesstimations. At any rate the moral of this disjointed story is simply this: sometimes our thinking must go beyond what our eyes can see.

The qualifications of a top-notch aviator are: emotional maturity, self-control, a sense of personal responsibility, attentiveness and foresight. Do you qualify?



Captain Gene T. Bragg

MANY PROBLEMS are encountered by pilots of the 937th Engineer Company (Aviation), Inter-American Geodetic Survey, flying in support of mapping operations in Central or South America.

Inter-American Geodetic Survey (IAGS) is engaged in mapping 15 countries in Latin America in collaboration with the host countries. The Guatemalan project is typical in that an Army Engineer officer is in charge and the cartographers are DA civilian employees.

Aviation support assigned to this project consists of one L-20, one H-19, one H-13, and one L-19, with four aviators and four mechanics. Each aviator is assigned additional duties such as supply, maintenance, etc. Each mechanic assigned to the project is well qualified to crew his particular type aircraft, and periodic classes are held on maintenance subjects to increase efficiency.

The flying that is part of a mapping program consists of reconnaissance, classification, logistics, photography, and transporting personnel and equipment. Mapping is taking place at the present time in the northern part of Guatemala. This is a dense jungle area approximately 150 miles long and 100 miles wide, with no improved roads.

Many problems are encountered in this area since all personnel, equipment, and supplies must be flown to the base camp.

Gasoline for our aircraft is the greatest logistics problem that we encounter. Purchased in Guatemala City in 55-gallon

---

Capt Bragg is assigned to the 937th Engineer Company (Aviation), Inter-American Geodetic Survey.

Operations in IAGS area spans the range from sea level to over 10,000 feet

metal drums, it is then transported by vehicle, or aircraft if there are no roads, to the base camp. Drums cannot be stored for a long period of time since gasoline will become contaminated. When empty, all drums have to be returned for cleaning and refilling.

Fuel cannot be pumped directly from the drum into the aircraft since water may be present. All gasoline is checked before use to make sure it is the proper grade of fuel. We have discovered kerosene in drums stenciled "aviation fuel." If not detected this could result in a major accident. All gasoline dispensed from drums is strained through a 200-mesh screen or a funnel covered with a chamois skin.

Aircraft spare parts present another major problem since we are only allowed to stock various line items. All major line items are stocked by company headquarters located in the Canal Zone. Aircraft deadlined for a part that we cannot stock are down until the item is received from the Canal Zone. All time change items are requisitioned far in advance to ensure the item is on hand when needed.

Aircraft maintenance is a continuous project. The terrain over which we fly is so hazardous that a mechanical failure means a major accident. All pilots, in conjunction with the crewchief, give aircraft detailed preflight inspections. No pilot says, "Don't worry about that; it isn't critical" as we sometimes might do in the States where we have good flying conditions. When it comes to maintenance, nothing is taken for granted or at face value; everything is checked and rechecked.

The rainy season in Guatemala, which runs from early May to mid-October, is a problem and a hindrance to maintenance. No hangars are available for cover in inclement weather, which means that all maintenance is performed as weather permits.

Communication is a very important part of flying over jungle terrain. Each aircraft is equipped with a VHF transmitter/receiver plus a high frequency radio. All aircraft are required to give a position report to the field station every 15 minutes. The field station equipment includes an AN/GRC-9 which is calibrated to the aircraft high frequency radio and is operated by one of the mechanics.

Radio maintenance is an additional duty assigned to a pilot,

but since no one is technically skilled in this field, it becomes a trial and error procedure. However, if the set is inoperative and we can't fix it, we may call for assistance from 937th Heaquarters at Fort Kobbe, Canal Zone.

Instrument flying in this part of the country is not recommended under any circumstances because of the non-availability of proper radio navigational aids. Most of these countries have only low-powered beacons. Since they have no alternate power source, they can go off without notice and be off indefinitely.

All helicopters flying over hazardous terrain are escorted by a fixed-wing plane in case of a forced landing in the jungle. Since the vegetation is so dense, it is possible to fly over wreckage and never see it.

Our primary mission is to support field operations. A field party will consist of 25 to 30 personnel, divided into station parties of 3 to 4 men. The station party will then occupy a station which is a vertical or horizontal control point.

Horizontal points are located at the highest possible elevation so they have an unobstructed range of vision. The stations may run from 5,000 to 7,000 feet or higher. This calls for classifying and careful planning to do the job safely.

Once the operation is assured, the aviator is given an overlay showing all points and number of personnel and equipment to occupy each station. After careful planning, using our helicopters, we start transporting personnel and equipment to the landing site nearest to these prospective stations. The equipment involved for each station averages approximately 800 pounds. This is necessary since they may not be resupplied for 8 to 10 days.

The field party may have to walk for two or three days, depending upon our landing site and its proximity to the station. If we cannot land close to the station we may have to drop tinfoil to mark the route they should walk or fly back and forth over the route towards the station.

Once the field party has occupied the station, their job is to clear and construct a 12′ by 12′ platform or an area of sufficient size to accommodate the H-13 or H-19 helicopter. This usually takes from 4 to 5 days to complete. Once this is completed we support the field party with food, water, and any other supplies they may need to accomplish their work.

While working in confined areas and from platforms, no pilot will exceed his or the machine's ability. All cargo is weighed before loading, and only the allowed weight is taken. Our motto is, "If it takes three loads under marginal conditions, make an extra trip and be safe."

No Army Aviator can long serve in such terrain and environment without becoming a safer, more conscientious pilot. Here experience counts, and you must learn quickly — to stay alive.

Army Aviators on duty with IAGS soon learn that professionalism is not merely a word; it's a requirement for staying alive

CRASH AND RESCUE INFORMATION

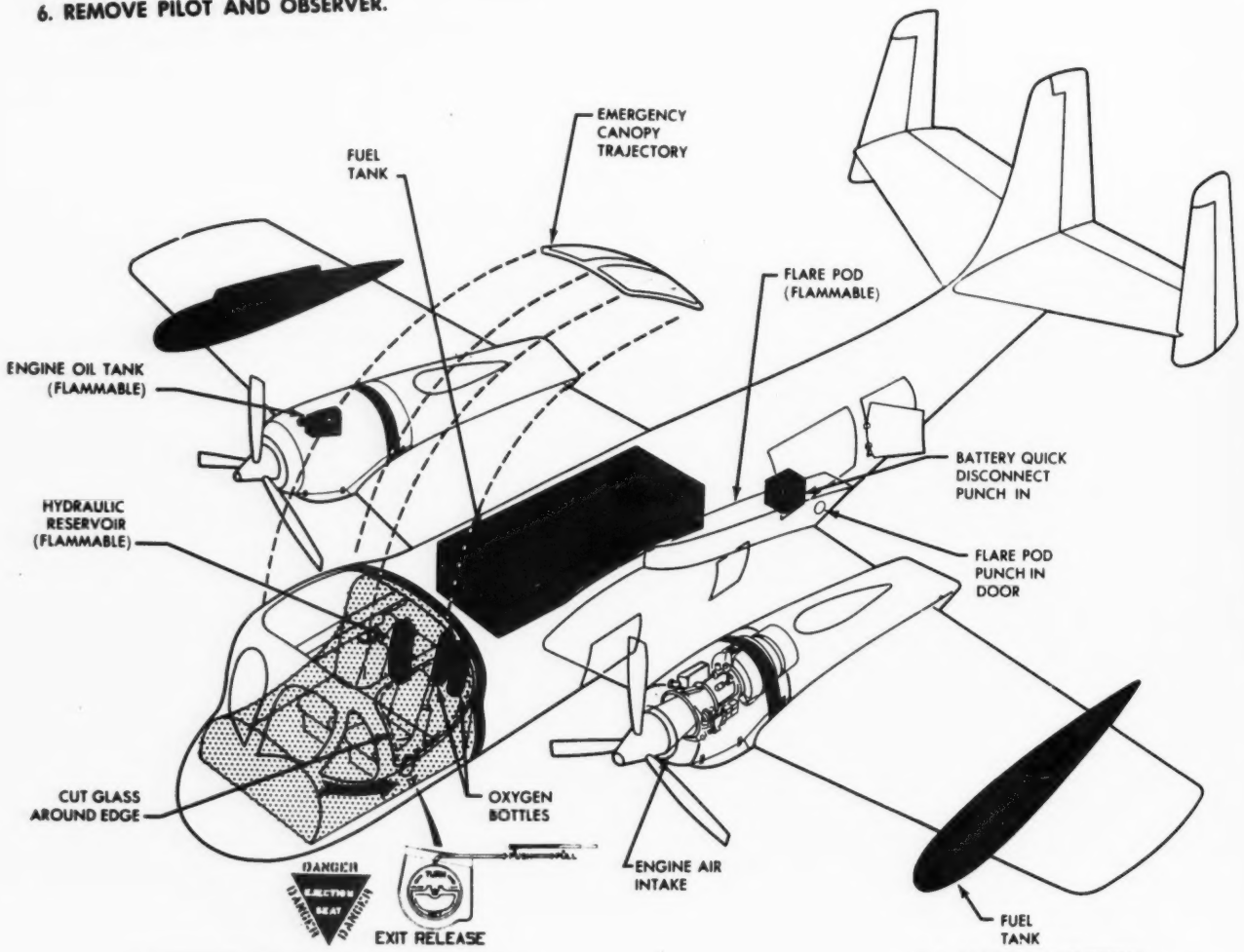
Time is a vital and critical factor in crash rescues, ground personnel as well as crash and rescue crews may be required to remove the pilot and observer from the cockpit. This Chart is published to indicate the correct emergency procedure involved in the rescue of personnel in a crash situation. Perform the following procedures.

1. **APPROACH AIRCRAFT.**
2. **GAIN ACCESS TO COCKPIT.**
3. **JETTISON OVERHEAD CANOPY.**
4. **SAFETY SEAT.**
5. **DEACTIVATE COCKPIT SWITCHES.** (TIME PERMITTING)
6. **REMOVE PILOT AND OBSERVER.**

GENERAL INFORMATION

There may be external fuel tanks on undersurface of wings, between engine nacelles and wing tips.

Battery is in the equipment bay located on the left side of the fuselage just aft of the wing. A "PUNCH IN" panel is provided in the door for emergency access to battery disconnect. If the flare pods are installed "PUNCH IN" panels are provided in their sides to gain access to the battery disconnect. Apply extinguishing agent to interior area fires through any of the openings indicated in the diagrams.



APPROACHING AIRPLANE

Approach the airplane from either side to gain access to the cockpit exit lock ring and release lever. If landing gear is extended and propellers are turning use extreme caution around cockpit area as propellers are close to cockpit. If landing gear is collapsed or retracted, stay clear of engine intake and exhaust as engine can still operate with propeller held stationary.

NOTE: If access to the cockpit area is impossible because engines are still operating flood engine intake with foam, CO_2 or water. This should stop engine.

COCKPIT ACCESS ●

1. Lift exit release lock ring and turn to UNLOCK position.
2. Open cockpit access door with lever, push IN at forward end, pull OUT on aft end and lift cockpit access door to full open position.
3. Grasp emergency canopy jettison handle and rotate 90° clockwise then pull. Emergency canopy should blow off.

CAUTION: Make certain all personnel are clear of canopy area and away from airplane in area of canopy trajectory.

If the airplane comes to rest in an inverted position and cockpit access door can not be opened, access to the pilot and observer must be gained through the cockpit access door glass area. (This is required due to construction of cockpit floor and cockpit side panels.) Cut cockpit access door glass around edge as shown on drawing.

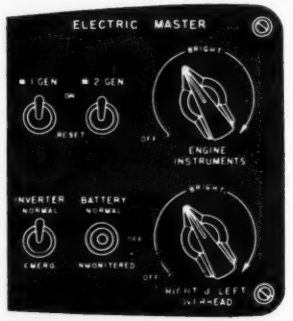
EJECTION SEAT SAFETY AND PILOT OBSERVER REMOVAL

AO-1AF, -1BF, -1CF CRASH CREW INFORMATION

COCKPIT DEACTIVATION

BATTERY SWITCH.
Turn battery switch to "OFF" (Center) position.

ENGINE MASTER SWITCHES.
Check engine master switches for "OFF" position.
NOTE: Battery switch must be "ON" for this switch to be effective.

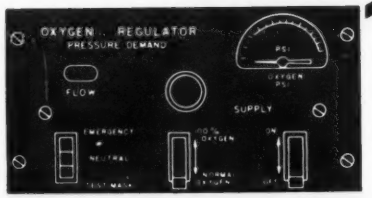


STORES SELECTOR (AO-1BF, -1CF)
Check armament power (ARMT PWR) switch for "OFF" position (Red Cover Closed).

STORES SELECTOR (AO-1AF)
Check armament power (ARMT PWR) switch for "OFF" position (Red Cover Closed).

EMERGENCY CANOPY JETTISON HANDLE

FIRE EMERGENCY CONTROL HANDLES
Pull OUT fire emergency control handles to shut-off all fluids at engines. Set fire extinguisher switch to relative engine if fire exists. (Located under guard of fire emergency control handle.)
NOTE: Battery switch must be "ON" for this step to be effective.



OXYGEN REGULATORS.
Turn pilots and observers oxygen regulators shut-off levers to "OFF" position.

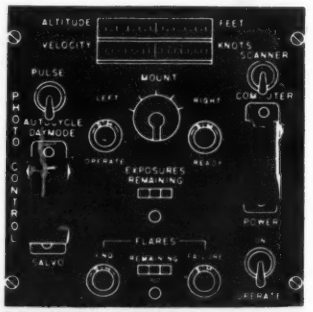
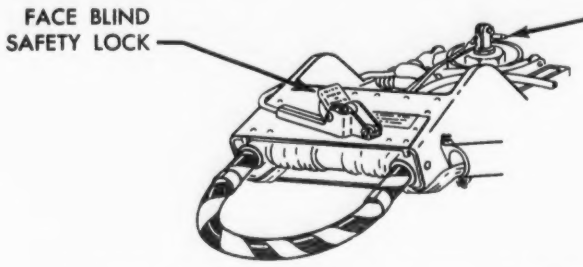


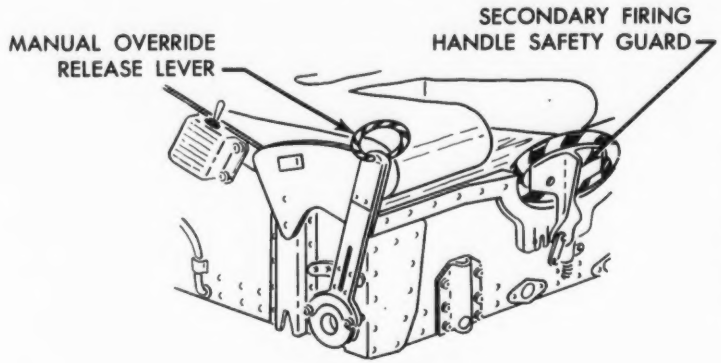
PHOTO CONTROL PANEL
Check SALVO and Power switches for "OFF" position (Red Covers Closed).

CAUTION: Do not touch any switches painted red or with red cover guards other than stores selector power and photo control salvo and power. Serious personnel injury could result.

Use common sense and good judgement if there is no fire, and if there appears to be little chance of one. It is advisable to leave the injured in their seats until qualified medical personnel arrive. To remove the pilot or observer, perform the following steps.

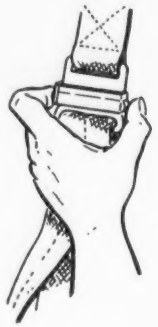


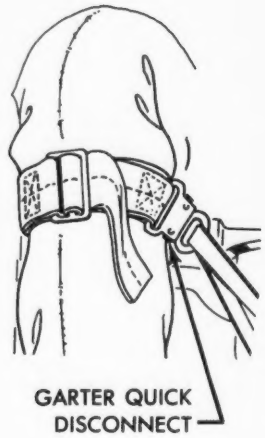
1. Install safety pin in ejection gun sear. If safety pin is not available a metal pin the diameter of a TEN-PENNY nail will safety the ejection gun sear.



RIGHT SIDE OF SEAT

2. Move manual override release lever OUTBOARD and AFT to release leg restraint cords.





3. Unlock harness quick disconnect fittings by squeezing release bar tabs and at same time moving release bar upward. (Harness quick disconnect fittings are located near pilots shoulders.)

4. Unlock lap belt and remove survival kit vertical restraint straps.

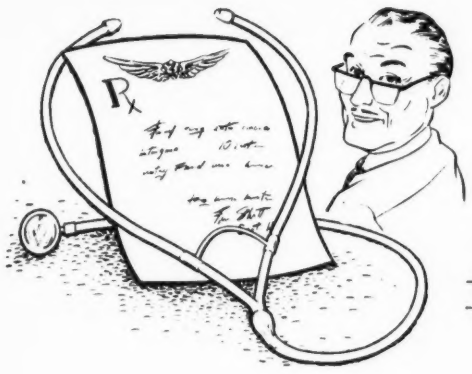
NOTE: If the harness quick disconnect fittings and the lap belt cannot be unlocked, or if the survival kit vertical restraint straps cannot be removed, the pilot or observer can be removed with parachute and life raft attached.

5. Tilt pilot or observer forward from waist and turn shoulders toward cockpit access door opening. Grasp pilot or observer under armpits, lift and pull through access door opening or emergency canopy opening.

NOTE: *Leg garters can be released from the leg restraint cords at the quick disconnect by squeezing serrated lock release tabs to free lock ring.*

NOTE: Leg garters can be released from the leg restraint cords at the quick disconnect by squeezing serrated lock release tabs to free lock ring.

moved with parachute and life raft attached.



MEMO FROM the flight surgeon

Colonel Spurgeon Neel, MC

Hyperventilation

AN INCIDENT recently occurred involving a healthy 30-year-old Army Aviator. He began to notice a tingling in his nostrils, then a feeling that his heart and breathing rates were not "synchronized." He felt that he was losing control of his breathing. He took a couple of deep breaths, then noted that his heart began to beat even faster. This was followed by dizziness and tingling all over. His fingers and wrists began to cramp and draw up, and there was spasm of his facial muscles.

Was this hypoxia? No. Fortunately, this aviator was on the ground, and was manifesting hyperventilation. Had he been in control of an aircraft at the time of this incident, another "unknown cause" accident might well have occurred.

Hyperventilation is a condition in which the respiratory rate and depth are abnormally increased. There is an excessive loss of CO_2 from the lungs which lowers the concentration of this gas in the blood and results in an increase in the alkalinity of the blood and body fluids. The chemistry of these effects is well known, but its understanding is not essential to dealing with the problem.

Symptoms of hyperventilation are primarily neuromuscular and psychomotor. Loss of CO_2 raises the alkalinity of the blood which increases the irritability of neuromuscular tissues. Superficial tingling of the extremities and the face follows, progressing to muscular spasm and tetany. Deterioration of muscular control and coordinated activity is invariably seen during severe hyperventilation. The effects of hyperventilation are accumulative and are synergistic with those of hypoxia, hypoglycemia, acceleration and fatigue. The consequences of these effects in an aviator in primary control of an aircraft are obvious.

The cause of hyperventilation in Army Aviation is almost always psychogenic and due to anxiety or apprehension, either conscious or unconscious. Involuntary overbreathing due to anxiety results in a vicious cycle. The results of hyperventilation produce anxiety which, in turn, aggravates the hypertension. Hyperventilation may accompany the increased depth and rate of respiration caused by hypoxia, but this is rare at the altitudes flown in Army aircraft. Hyperventilation is much more common, hence much more significant in Army Aviation than is hypoxia.

Prevention of hyperventilation is based upon physiological training. The aviator must understand the nature, cause, and symptoms of hyperventilation and guard against overbreathing. He must understand the differences between the manifestations and management of hypoxia and hyperventilation. This is not easy but is simplified at the altitudes flown in Army Aviation.

When the aviator realizes that he is overbreathing, he should reduce the rate and depth of his respiration. Rebreathing into a bag (burp bag or lunch sack if available) will permit rebuilding of blood CO_2 to a normal level, with cessation of symptoms. In dual flying, each aviator should observe the other for insidious hyperventilation. Should an aviator's behavior change or his flying become erratic, hyperventilation should be suspected by traffic control and supervisory personnel. Realistic physiological training is essential to the control of hyperventilation in Army Aviation.

Fire Control Systems

Universal vs. Specialized Approach

Henry G. Benis

A BIG QUESTION facing today's modern mobile Army is how best to coordinate its varied firepower. The helicopter, with its multipurpose mission capability, is an integral part of the new Army.

It follows, then, that one of the most pressing problems encountered by the people concerned is how to provide effective striking power for all types of helicopters.

Diversified armament requirements can best be achieved through the universal approach, for it is obvious that no single weapon is effective against all targets. Ideally, provision should be made for rapidly changing the types and quantities of weapons as directed by the mission and target.

At present, the Army helicopter can only depend on its ability to maneuver and nap-of-the-earth flying to be less vulnerable to enemy fire. This capability, of course, is strictly a passive defense. The future armed helicopter will provide the necessary combination of **active** and passive defense. This will enhance its survival capabilities on the battlefield—and implement its role as a reconnaissance and observation vehicle.

The mission of the helicopter on the modern battlefield is widely diversified, and the anticipated target types may vary considerably. It is obvious that **no single weapon** is effective against all targets and, in most circumstances, a combination of weapons will be required. Ideally, provision should be made for rapidly changing the

This article has been extracted from a speech given by Mr. Henry G. Benis at the Institute of the Aerospace Sciences, National Army Aviation Meeting, April 13, 1961.

Mr. Benis is Helicopter Armament Project Engineer, Missile Production Section, General Electric Company, Burlington, Vt.

types and quantities of weapons as dictated by the mission and target. Let's consider the various types of weapons available.

The **automatic weapon** is generally considered to have a bore diameter of 40mm or less —with a choice of ammunition for the specific mission.

For the **missile,** guidance may be either command, homing or terminal; but ballistic or inertial guidance is normally employed with the longer range missiles.

A primary disadvantage of the command guidance SS-11 missile is the need for remaining on target for the entire flight of the missile. This places the helicopter in a particularly vulnerable position. The ultimate use of homing or terminal guidance offers a solution to this problem.

Salvo fired rockets offer good target kill capabilities, although weight restrictions may limit their application to the heavier aircraft. Work is currently underway to optimize stability and dispersion of rockets when fired from slow moving aircraft.

The recoilless rifle presents many problems as an aerial weapon. For example, excessive weight, reload difficulties, blast effect, sighting, ranging, computing, and relatively low velocity impose limitations on its application. However, on the heavier specialized weapon ship (which will be discussed more fully later) the recoilless rifle may be used because of its other capabilities.

The use of **bombs** or bomblets is primarily limited to the fast, higher flying fixed wing aircraft.

Consideration must be given in the future to **chemical, bacteriological** and **radiological** weapons as aerial delivery systems. [If possible, CBR weapons should be components of an existing aerial delivery system, and not a separate means.]

The most serious limitation to the successful completion of the helicopter mission on a forward battle area is the aircraft's vulnerability to enemy small arms fire. A ground fire suppressive capability is **essential** for all helicopters, **regardless** of mission, if enemy contact is a possibility. Therefore, the only situation for which suppressive armament is not [usually] required would be for medical evacuation and cargo transportation over friendly territory or behind the forward edge of the battle area.

This indicates that suppressive armament is an **essential component** of the fighting aircraft and will seldom be removed. In certain helicopters, such as a weapons ship, it could well be an integral part. On other aircraft of more diversified usage, it may be in kit form for rapid removal as conditions indicate. We should also note that suppressive armament can be used for exploratory probing fire in reconnaissance missions.

The optimum area type weapon for fire suppression is the automatic machinegun. It provides a high rate of fire, adequate ammunition complement and lethality against enemy ground forces consistent with minimum weight and size requirements. Efforts have been concentrated primarily in the use of the M-2 and 7.62 millimeter weapons, and the .50 caliber to a lesser degree. From one to four guns have been employed.

The optimum location of suppressive armament warrants a closer look (fig. 1). As indicated previously, a combination of weapons will oftentimes be required. For example, machineguns and rockets or machineguns and missiles may be used. On the larger aircraft (where c.g. shift does not pose a serious problem) mounting suppressive armament on the nose (or preferably faired into the nose) offers the best solution. This allows the largest super-elevation angle, maximum range, optimum safety and provision for all weapons to fire at a target area for a multigun installation. Furthermore, this location does not **in any way** compromise other heavier weapon systems which may be side mounted near the c.g. of the aircraft.

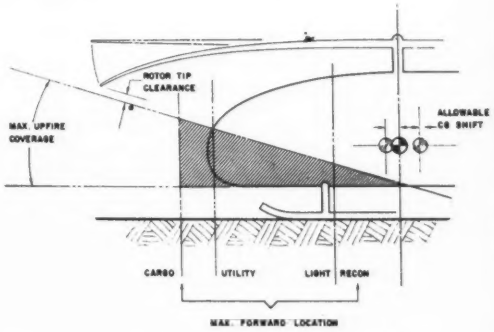


Figure 1. Suppressive armament location

Armament location on the light helicopter (having a design gross weight under 6,000 pounds) is an entirely different story. The c.g. shift dictates a location closer to the rotor mast axis, and gross weight limits the armament capability. Typical armament may consist of machineguns, with the addition of two missiles or a rocket cluster.

This brings us to the **heart** of the problem. Can the diversified armament requirements

best be achieved through a **universal** or a **specialized** approach?

Ideally the universal approach or "kit concept" offers the greatest advantages by simplifying logistic problems, easing maintenance, lowering costs and minimizing airframe modifications. Actually (considering the problems and restrictions already outlined) the universal approach **can be achieved** by the use of three basic armament packages.

The first is a ground fire suppression system designed for use on any helicopter ranging from the light tactical transport to the flying crane (fig. 2).

This system would provide a nose-mounted turret (movable in azimuth and elevation) which could carry conventional

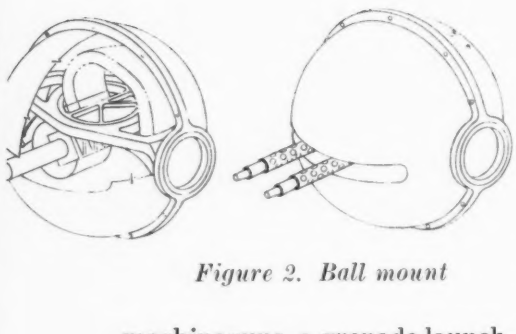


Figure 2. Ball mount

machineguns, a grenade launcher, or possibly a combination of both.

Relatively simple and interchangeable attachment provisions can be designed to mount several weapons or multiple combinations thereof. Although normally a vital component of the combat aerial vehicle, this kit can be quickly removed for applications where active defense is not deemed necessary, and maximum payload capacity is required.

The second armament package is also primarily suppressive, but is compatible with the light observation helicopter where c.g. shift limitations will not permit a nose installation and armament weight must be held to a minimum (fig. 3).

The weapon will be trainable in elevation only, and azimuth aiming will be effected by rudder control of the highly maneuverable aircraft. Side

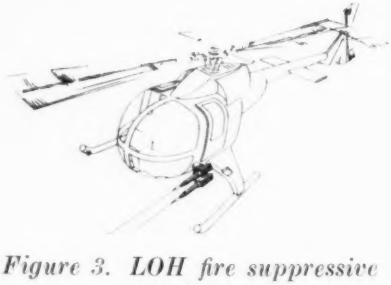


Figure 3. LOH fire suppressive installation

mounting of the package will require appropriate airframe hard points. And, once again, the package must be designed for quick installation or removal and interchangeability of weapons as illustrated (fig. 4).

These two package approaches would provide suppressive firepower for **all** conventional Army helicopters in present inventory and those planned for the future. Furthermore, growth potential is provided for accommodation of new developments in automatic weapons with a minimum of

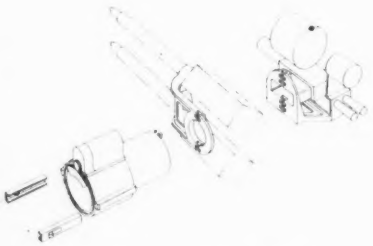


Figure 4. LOH mount

modification or retrofit.

The third and final armament package would provide the heavier firepower capability necessary for point, fortified area and air-to-air targets (fig. 5).

This armament concept involves the larger caliber automatic weapons, rockets, missiles—and possible CBR armament. Invariably, this will involve a considerably heavier system from both weapon and fire control standpoints since, inherently, more complexity is

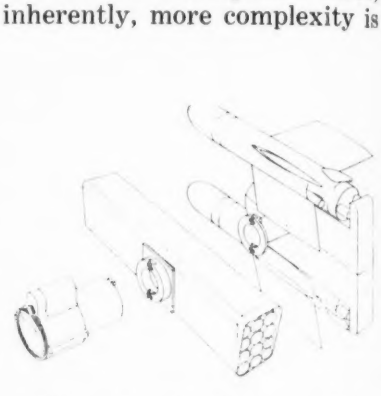


Figure 5. Missile and rocket mount

required to assure satisfactory hit probability for point targets. The logical package location is at, or very close to, the aircraft c.g. This positioning means that the changes in weight after armament dispersement will have a negligible effect on flight characteristics. As before, the package must be designed for very rapid installation, reloading and interchangeability of weapons as the mission may dictate.

Careful consideration should be given to the use of existing aircraft structures for system attachment. These structural points could include auxiliary fuel tank hard points and cargo tie-down fittings, because they would entail a minimum of air-

craft modification and cost. If specially designed hard points are required, they should be common to the various helicopter weight classes to permit use of a single armament package.

A past example of this design approach is the wing mounted bombrack or pylon on fixed wing aircraft which can accommodate a wide variety of external armament stores. It is quite conceivable that a single or split side mounted package (based on a building block approach) can be effectively designed for mounting various quantities of missiles, rockets and machineguns, or any combinations desired (fig. 6).

This concept would fulfill the primary need for armament without compromising or unduly limiting the diversity of the helicopter family.

One category for which the package or kit concept may not readily apply is the weapons ship which is used primarily in missions of mobile fire support or defeat of hostile armor.

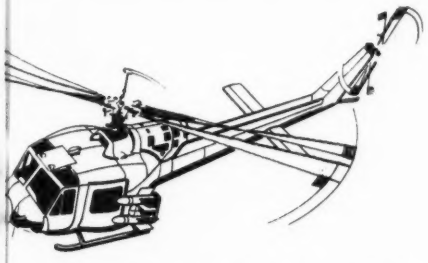


Figure 6. Aircraft and mounts

Either the light or medium tactical transport would fill this role, with the latter having the advantage of a heavier payload capability. The specialized approach appears mandatory.

The light or medium tactical transport is a heavy weapons platform with an accurate fire control system capable of knocking out heavily armored targets at ranges in excess of 2,000 meters. The aircraft itself may be a modified version of its troop and cargo carrying counterpart. Ranging, stabilized line of sight, lead angle computation and accurate servo control are required to ensure accurate projectile delivery and a high first round kill probability. The complexity and accuracy requirements may exceed that which would normally be expected of a removable package.

This, then, dictates an **integral mating** of the aircraft and armament. The likely requirement for more than one weapons system makes the specialized approach even more desirable, and future developments may see the need for all-weather armament capabilities which may introduce the use of additional subsystems. These subsystems could be infrared or high sensitivity television which would provide the ability to identify and aim at targets under all conditions.

However, the armament concepts described leave many detailed questions unanswered and a brief discussion of more critical subsystem components such as sighting, ranging devices and lead angle computers is warranted — for an accurate sighting system is essential to ensure high hit probability for **all** aerial delivery weapons. This is particularly true for point type targets. In the past, surplus optical sights have been used for test evaluation, and these have been existing fixed sights.

Design studies for improved sighting techniques made by the General Electric Company resulted in the following preliminary recommendations. For aircraft, such as the LOH, it is probable the pilot will also be controlling the firepower. To perform this dual function, the sighting device as well as the fire control **must not** interfere with the normal functions necessary to fly the helicopter.

Therefore, these **conditions of use** dictate the major requirements of the sighting device:

- Minimum view obstruction.
- Minimum required movement of pilot's head in sighting.
- Rapid visual acquisition of the sighting pattern throughout normal range of head positions.
- Devices used shall not cause undue hazard in case of a crash landing.

The basic principles of an aiming device that combines these advantages and meets all the requirements necessary for pilot or copilot operation is shown in figure 7.

This device provides a collimated light beam containing a reticle pattern generated by a projector located off to the side of the operator's head. A transparent spherical segment in front of the pilot or a spherical windshield panel could be used as the reflector. A collimated pattern (such as one produced in a conventional reflex sight) presents a display whose light rays appear to come from an infinite distance. In other words from any point on the pattern, the light rays are all parallel.

All targets that are to be considered are of sufficient range that when the collimated pattern is superimposed on the target, the pattern appears to remain on the target for all eye positions within the geometry of the system. Therefore,

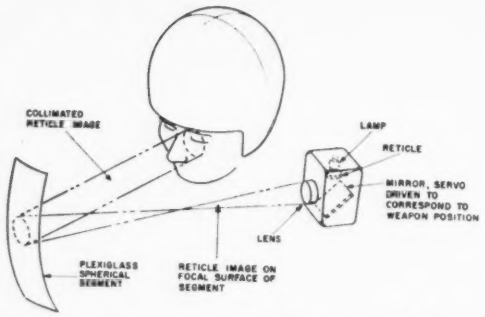


Figure 7. Collimated Sight

movements of the operator's head within the physical limitations of the optical components has no effect on the sighting line, since the sighting parallax, for all practical purposes, has been eliminated.

Collimated patterns in reflex sights are produced by locating an illuminated reticle pattern in the focal plane of a convex spherical lens. In the concept illustrated, a collimated pattern is produced by arranging the illuminated reticle and projector lens in such a manner that a real image will be formed at the focal surface of the spherical segment. The segment has sufficient reflective characteristics to act as a spherical concave mirror; and since the reticle image is formed at the mirror's focal surface, a collimated image is reflected.

Because it is not possible to have both the operator's eyes and the reticle image projector at the center of the spherical segment, the projector is placed to one side of his head, and the center of curvature of the segment is between the operator's eye and the projector.

The reticle image is projected onto a small mirror before passing through the projector lens, so that the angular position of the image projection on the spherical segment is a function of mirror position. By using synchro transmitters on the weapon, the angular position of the weapon (with respect to the helicopter) provides the signal for the driven mirror. The reticle image projected on the spherical segment then indicates the position of the weapon.

This aiming arrangement permits **full freedom of view.** And since the reflecting surface is spherical and the operator looks through it from near the center, there is no significant added optical aberration for normal viewing. The operator need not hold his head exactly at the nominal position to see and properly use such a collimated aiming reference.

This sighting system may also be used with suppressive fire or area fire and air-to-air gunnery.

This brings us to the problem of ranging, one of the most important considerations of a fire control system.

Visual range estimation can introduce very large system errors, and reference data indicates that a mean error of 25 percent can be anticipated in visual range estimation from a fixed position to a fixed target. If the armed helicopter and the target are moving (which is normally the case) errors may be considerably greater.

So the use of a ranging device may prove mandatory when **accurate** firepower delivery is required.

Essentially there are two basic methods of range finding: triangulation and echo measuring. Coincidence, stereoscopic and stadiametric range finders are the most common instruments for ranging by triangulation. Radar, sonar and optical radar are examples of echo measuring techniques. Currently, the latter type doesn't apply to helicopters because of weight, cost and the complex nature of the system.

The simplest optical ranging method is the stadiametric ranging device, an existing technique which may be incorporated with a minimum of expense. As a matter of fact, this device could readily be incorporated in the sighting concept previously described. However, this method does have some inherent disadvantages:

- The target size must be known beforehand.
- Oblique viewing of the target will introduce errors.
- The operator must accurately place the target in the center of the stadia ring.
- Manual adjustment for ranging is required.

No device is presently available which will meet all the ranging requirements for this application. However, a monocular range finder, currently under development by General Electric, looks very promising.

The basic operation of this device is shown in figure 8. The target image path is folded using a parabolic and flat mirror to provide a compact optical system. A light chopper and photosensitive detector are utilized to detect target image location, and a servo system positions the detector to maintain peak signal. A potentiometer pickoff provides a read-out proportional to range.

Compared with a conventional coincidence or stereoscopic range finder, the advantages of the monocular range finder are:

- Smaller size and less weight—since only one optical system is required.
- Greater accuracy — be-

cause electronic resolution is better than the human eye.

- Ease of use—since no coincidence adjustment is made and, once aimed, its operation is completely automatic.
- Range can be presented as the reading on a dial or an automatic input to a fire control system.
- Speed of response provides continuous range information as the distance to target changes. Because of an inherent averaging feature, helicopter motion has much less effect on accuracy, especially since the target and its immediate environment, as viewed from the air, are very close to the same range.

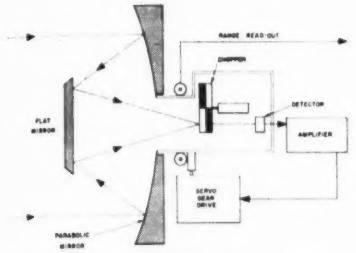


Figure 8. Monocular ranging schematic

Compared with echo techniques, monocular ranging is less complex and is passive—that is, it cannot be jammed.

A production visible light monocular ranger could be developed with an accuracy of 1 percent at 1,000 yards and 2 percent at 3,000 yards. The complete device including optics, detector, amplifier and read-out control is expected to occupy less than 1 cubic foot and weigh approximately 30 pounds. It would operate from 28 volts d. c. and require approximately 20 watts of power.

For air-to-ground firing, lead angle corrections can be very important depending on helicopter and target speed, range, degree of azimuth, broadside firing, and weapon muzzle velocity. Up to maximum effective range, and with forward speed of 100 knots, the error at the target could approach 100 yards, if no lead angle correction is provided. The fire control problem becomes even greater when we consider air-to-air engagements where the target is moving at a much higher speed.

Moving target A travels a considerable distance during the flight of a projectile fired from aircraft B (fig. 9). For that reason, it is necessary to aim the weapon in such a way that the projectile will reach the point in space C when the target has reached that point.

The total lead angle required is the sum of the lead angle in the target plane D plus the superelevation angle E required because of gravity drop.

The simplest way to solve a dynamic fire control problem from a moving platform is by use of a lead computer based on a single freely suspended gyroscope (fig. 10). Such a computer is currently in production for the F-105 Fighter-Bomber and can be readily adapted to the helicopter application.

When used with a flexibly mounted weapon, the computer is carried on the gun position. Where the weapon is rigidly mounted, the computer may be placed at any convenient location in the aircraft.

The computer receives an input of present range and the observed angular rate of motion of the target. From this it computes the lead angle and gravity offset corrections. These angles are used to offset

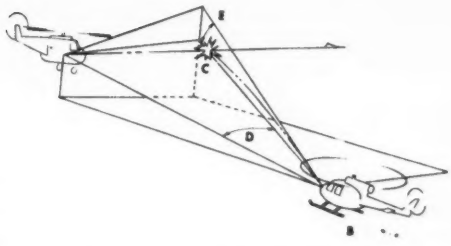


Figure 9. Air to air fire control problem

the line of sight position displayed to the gunner in such a manner as to automatically place the guns on the computed future target position.

The gyro lead computer previously described for use with both the flexible and fixed weapons could also be utilized to facilitate the capture phase of the SS-11 fire control problem.

The computer would remain mounted on the flexible weapon launcher as before.

By helicopter maneuver (with the computer orientated on the ship's reference line) the line of sight would be placed approximately on the target position. When the missile is launched, the gyro computer would establish this line in space in its "memory."

Figure 10. Gyro lead computer

The operator then tracks the missile in flight by moving his optical aiming line. A signal from the computer causes the

missile to move toward the "memorized" line in space which was the original aiming line to the target.

Further refinements of the missile position are now obtained by line-of-sight manipulations in which the missile will follow the line of sight at a rate proportional to the missile's displacement from that line of sight. As with the present system, optical magnification would be provided by low power binoculars.

The equipment and techniques mentioned can be employed in a fire control system to assure a high hit probability despite the inherent motion and evasive flight maneuvering of the helicopter. However, **it is not meant to imply** that all of these subsystems are a necessity for a weapons system. For example, with suppressive armament, where probing and strafing firepower will normally be employed, system accuracy equivalent to that required for a point target is not necessary. Further tactical analysis, test and evaluation is required to determine the happy medium between system accuracy and complexity.

The establishment of helicopter armament system requirements and specifications is in reality just beginning. In many respects, a considerable amount of effort is yet to be expended and work to be accomplished.

However, it is gratifying to note that the situation is starting to jell and a concentrated effort is being made to get helicopter armament hardware into the field for evaluation and general use.

Team Effort

NINETEEN members of a U.S. Seventh Army disaster relief team and two H-19 Chickasaws were airlifted by USAF C-124 Globemaster from Echeterdingen Air Field, Germany, 25 November on a mercy mission to Mogadiscio, Somalia. The party was to assist in the medical evacuation of casualties caused when flood waters threatened the lives of thousands with disease and hunger and left large numbers homeless.

In the team were ten members from the 421st Medical Air Ambulance Company, five from the 29th Transportation Aircraft Maintenance Company, two communications specialists from the 16th Aviation Operations Detachment, one from the 97th Signal Battalion, and a radio-broadcast specialist from Headquarters Seventh Army.

Left: Seated on a steel "sled" a Seventh Army H-19 helicopter enters the gaping mouth of an Air Force C-124 Globemaster for airlift to Mogadiscio, Somalia

From The USAAVNS

DEPT OF P&NRI

The following chapters in FM 1-5, Army Aviation Organizations and Employment, are being prepared (new or revised):

Chapter 2. Aviation Company, Army

Chapter 5. Aviation, Fixed Wing, Light Transport Company

Chapter 8. Aviation Company, Corps

Chapter 9. Aviation Company, Corps Artillery

Chapter ( ). Army Air Traffic Regulation and Identification Company

Chapter ( ). Airmobile Company, Rotary Wing (Light)

The manuscript on FM 1-( ), Operation of the AN/USD-1 Surveillance Drone Aircraft, will be submitted to Headquarters USCONARC in June 1962.

FM 1-( ), Aerial Observer Training, has been forwarded to Department of the Army for printing. The Army Subject Schedule for aerial observer training is in the final review stage and will soon be available.

Army Training Programs and Army Training Tests are now being prepared at the same time draft TOEs are written.

TM 1-300, Meteorology for Army Aviation, is undergoing a complete revision.

Changes to TM 1-225, Navigation for Army Aviation and TM 1-215, Attitude Instrument Flying, are in final phase of preparation. The changes discuss the FD-105 Instrument System which has been standardized as the AN/ASN-33V Computer Set, Navigational. This system is used in the L-23 and in most Mohawk aircraft.

DEPT OF MAINT

Starting with the Officers Fixed Wing Aviators Course (OFWAC) 62-3, the students will receive basic maintenance instruction on the L-20 Beaver. This instruction will be given during Phase B, which for 62-3 began on 29 January 1962.

Previously, no maintenance instruction was given to the students on the L-20, even though the aviators graduating from Phase C were qualified in this aircraft.

The Officers Rotary Wing Aviators Course (ORWAC) Test Class 61-10, received 8 hours of maintenance instruction on the H-13 Sioux. They were given 45 hours of special transition training in the H-13 as part of their Phase II program.

The L-20 Beaver is no longer a Class I aircraft for weight and balance purposes. According to Change 1 to AR 95-16, dated 18 September 1961, the Beaver is now in Class II. This means that on all L-20 flights, when an aircraft clearance (DD Form 175, DD Form 1080, or FAA Flight Plan) is filed, a DD Form 365F will be filed with the clearance form, or a certification made on the clearance form that a DD Form 365F has been previously filed for an identical load.

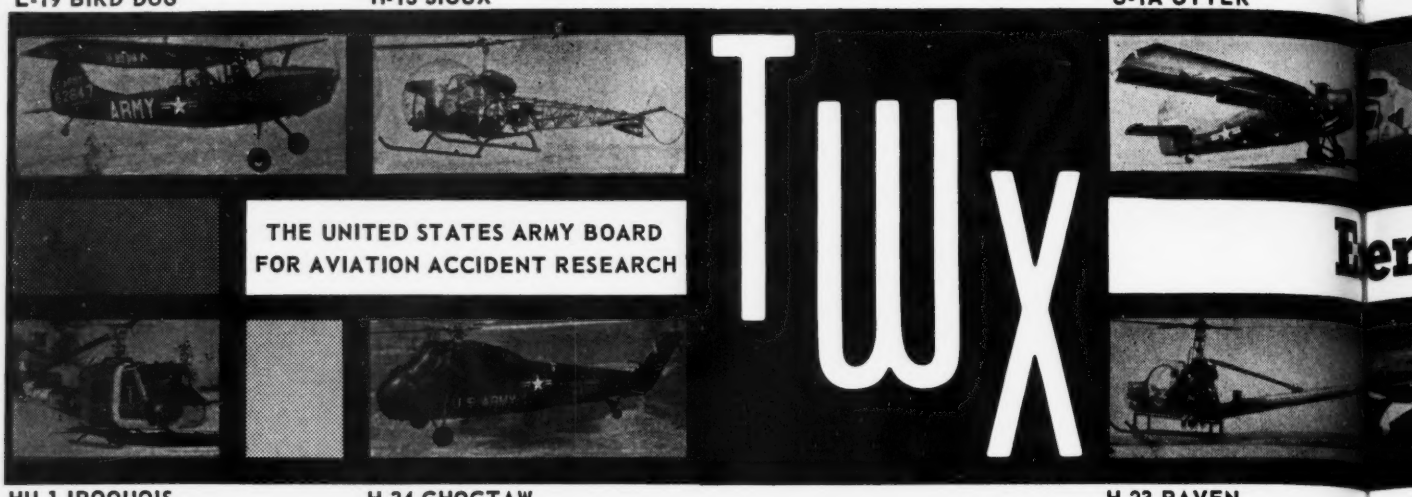
DOI

AO-1B (Mohawk) training has been deleted for FY 1962. It was originally planned that 24 aviators would receive training in the AO-1B aircraft during FY 62. Deletion of the AO-1B program will not affect the AO-1A aviator input for the remainder of FY 62.

Due to the shortfall in student inputs to the Officers Fixed Wing Aviator Course (1-A-1980A), USCONARC has been allocating quotas for TDY inputs to Phase C (Instrument) training. Quotas available are allocated to the CONUS armies by USCONARC.

Enlisted Maintenance Course 1-R-676.1 (H-21) has been placed in an inactive status for the remainder of FY 62 and FY 63. There is no requirement to train mechanics in MOS 676.1 due to a current overage of this MOS in the field. It is anticipated that Course 1-R-676.1 may be activated during FY 64.

A new fixed wing stagefield, Aux #3, near Enterprise, Ala., will become operational in the third quarter of FY 62.



L-19A STRUCK TREE while taxiing. Incident damage to right wing. No injuries.

L-20 LANDED LONG, skipped and bounced. During go around attempt, aircraft went off left side of runway, striking main rotor blade of parked H-19. Aircraft continued to climb and landed without further incident. Major damage to L-20 propeller, left wing and strut, and H-19 main rotor blade.

H-19 TURNED DOWNWIND, lost translational lift, and hit ground on right main gear. Aircraft then fell on its side. Aircraft destroyed. No injuries. Suspect settling with power.

H-23D TAIL ROTOR STRUCK GROUND during practice autorotation. Major damage to tail rotor, one-inch drive shaft, horizontal stabilizer and tail boom. No injuries.

L-19A WHEEL LOCKED during landing. Aircraft ground-looped, causing major damage to right wing, propeller, and engine cowling. No injuries. Ice, due to freezing weather, found around radius of inner half of right main wheel assembly.

H-21C ENGINE FAILED in flight. Aft rotor blades struck trees during autorotative forced landing. Major damage to aft rotor blades. No injuries. Suspect fuel starvation.

H-34A ENGINE LOST POWER during landing approach. Aircraft struck ground, shearing right gear, allowing main rotor blades to strike ground. Major damage. No injuries. Suspect carburetor malfunction.

L-19A STRUCK CHOCK with right wheel while taxiing and nosed over. Propeller struck pavement, causing sudden engine stoppage. Major damage to propeller, engine, and tail wheel spring. No injuries.

H-19C NOSE GEAR DROPPED INTO HOLE during landing at field training site. Incident damage to oleo strut. No injuries.

H-13H STRUCK WIRE during range inspection flight at low altitude. Wires, broken by main mast, wrapped around forward short shaft, pulling it out of transmission. Aircraft was autorotated and tail rotor guard was bent during touchdown. Minor damage. No injuries.

HU-1A CRASHED during service mission. Pilot, crewchief, and two passengers killed. Aircraft destroyed. Suspect inadvertent flight into instrument flight conditions. Witnesses state area was covered with fog at time of accident. Pilot was not helicopter instrument qualified.

L-20A STRUCK SNOWBANK during final approach. Incident damage to right main landing gear. No injuries.

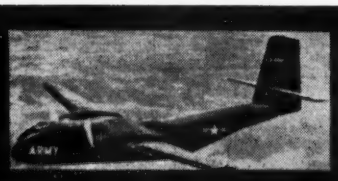
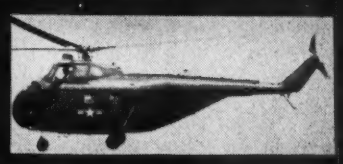
H-21C LANDED SHORT of end of taxiway. Helicopter was last aircraft in flight of 20 H-21s. Major damage to left vee brace on main gear, firewall, and keel. No injuries. Blowing dust from other aircraft caused reduced visibility.

L-20A ENGINE FAILED during flight, then started with extreme vibration at reduced throttle. Increased throttle caused engine to fail repeatedly. Power was reduced and aircraft completed forced landing with no structural damage. Connecting rod of No. 2 cylinder found broken in two places. Action of engine on broken parts caused damage to cylinder skirt, piston, wrist pin, and crank case.

L-20 STRUCK JEEP while taxiing. Incident damage to left elevator. No injuries.

AO-1 MOHAWK H-21 SHAWNEE L-20 BEAVER

Excerpts From Dec. and Jan.

L-23 SEMINOLE H-37 MOJAVE AC-1 CARIBOU H-19 CHICKASAW

L-23E LOST OIL PRESSURE in No. 1 engine during instrument flight. Aircraft declared emergency and was given GCA approach. Oil pressure continued steady decrease until low limit red line was reached one mile out on final. Propeller was feathered and aircraft landed without incident. Suspect oil breather system, filled with ice, was unable to vent condensation. Weather, −12° F at flight level of 6,000 feet, considered a factor.

H-23D LANDED HARD during practice autorotation. Main rotor flexed into tail boom. Major damage to main rotor blade, tail boom, aft tail rotor drive shaft, tail rotor assembly, bubble, and other minor components. No injuries. Blue turnbuckle of tail rotor control cable pierced bubble and passed through cockpit, narrowly missing instructor pilot.

H-23D ENGINE FAILED during landing approach. Aircraft completed forced landing with no damage. Excessive metal filings found in engine and transmission screens, and engine sump.

L-19E OVERTURNED due to excessive braking following loss of directional control. Major damage to both wings, left stabilizer, rudder, propeller, and cowling.

L-19A CAUGHT FIRE during engine start. Engine was over-primed, causing carburetor to flood. Airscoop and carburetor filter burned. Incident damage. No injuries.

H-13H STRUCK GROUND during attempted power recovery from practice autorotation. Major damage to main rotor, transmission, skids, tail assembly, and bubble. No injuries.

L-23D CRASHED after reporting rough engine during IFR flight. Pilot and copilot killed. Aircraft destroyed. Cause undetermined pending investigation.

AO-1C NOSE WHEEL TIRE BLOWN during landing. Incident damage. No injuries.

H-21C EMITTED FIRE AND SMOKE from engine compartment during test flight. Aircraft completed forced landing with no damage. Generator overheated, causing generator seal to fail.

H-13 ENGINE FAILED during test flight. Main rotor blades struck telephone wires during autorotation into narrow street. Aircraft landed in level attitude with great force. Both skids collapsed. Bubble broken. Console smashed, and main rotor blades bent. Pilot and crewchief hospitalized for observation. Extent of injuries unknown.

RL-26D SETTLED AFTER TAKEOFF, while gear was cycling. Aircraft settled on belly and radar antennas, bouncing left main gear into nacelle. Actuator was broken and nacelle skin torn. Left gear then locked down and aircraft bounced on it again before becoming airborne. Landing was completed without further damage. No injuries.

H-21C HYDRAULIC RESERVOIR COVER came off in flight and struck aft rotor blade. Incident damage to rotor blade.

HU-1A TAIL ROTOR FAILED during landing approach. Pilot added power to continue flight to where running landing could be made. Engine failed and aircraft was autorotated into rice paddy with no damage. Tail rotor pitch control mechanism failed. Cause of engine failure undetermined pending analysis.

John E. Gibson

HEALTH, most of us will agree, is our most priceless asset and today's medical researchers are discovering that it is far easier to show a man how to stay healthy than to help him regain his health after it has been lost.

For this reason, researchers have been concentrating of late on preventive therapy. To this end, scientists in universities, clinics, and research foundations have been seeking to discover the most effective means of staying healthy. Their findings make it clearer than ever that, when it comes to health, an ounce of preventive medicine is worth a pound of therapy. Recent discoveries of factors contributing to good health add up to a most effective—and economical—form of insurance for you and your family. Here are some of the most significant things they've discovered:

1. **How much exercise, and what kind, do you need to stay healthy?**

It is a fact that a certain amount of exercise is necessary to good health, and it is also well established that too much or too violent exercise can be worse than not enough. Most people—particularly sedentary workers — don't get either enough physical activity or enough of the right kind.

Desk workers fall into one or the other of two categories: Those who seldom take any exercise at all (they drive to work, drive home, eat, sit and watch TV or bury themselves in a book or magazine, or drive to a movie where they sit and watch the picture, and on a weekend they'll likely take a Sunday drive). Those who sit five days a week at a desk—with an occasional walk to the water cooler—and then crowd the weekend with such a round of strenuous and unaccustomed exercise that they overtax themselves, building up cumulative fatigue that lowers physical resistance and actually leaves them less fit than when they left the office.

To find out just how much and what kind of exercise a person needs to keep healthy, Dr. Laurence E. Morehouse, professor of physical education at the University of Southern California, has conducted an ex-

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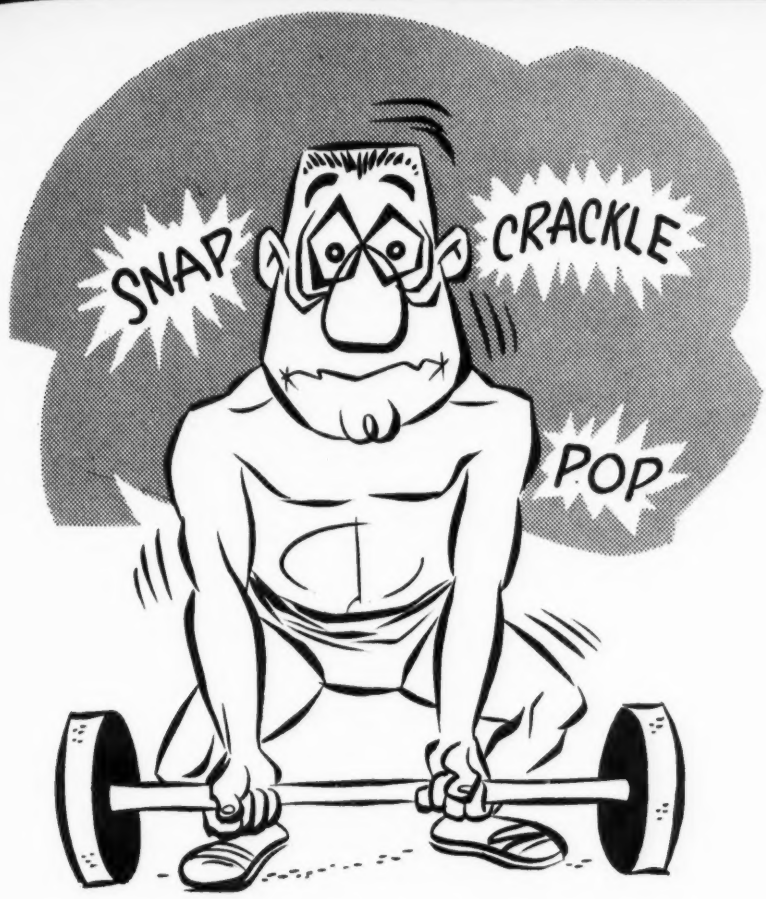


tensive study. His findings show that two 10-minute sessions a week of the proper exercise can keep the average adult in good physical condition.

He emphasizes, however, that this does not mean 20 minutes a week of toe touching, knee bends, arm waving, and other traditional setting-up exercises. Bending over and touching the toes, he points out, actually does more harm than good. This is because such exercise stretches the back muscles, already stretched to flabbiness by sitting down.

Here is a home exercise program that Dr. Morehouse's studies show to be most effective.

Vigorous warmup exercise for several minutes, such as running in place. This will build up endurance.

Stretching exercise for neck and back of neck.

Abdominal toning exercise, such as slow leg raising from a supine position.

Arm and shoulder exercise, such as pushups from floor, wall, or table.

2. **How much sleep do you need?**

Although some people can get along on less, the average person will be healthier and longer-lived if he gets his full eight hours. In a wide-scale survey conducted by the Life Extension Institute, investigators asked thousands of men and women who had lived to a hearty old age about their mode of living.

The examiners found that "sleep was the most common denominator. Some drank, others never touched alcohol. Some smoked, others didn't. Some worked hard all their lives, others took it easier. But all saw to it that they got enough sleep, usually the traditional eight hours, all through life."

"Enough" sleep for you will depend to a large extent on what you do for a living. Colgate University studies have

shown, for example, that mental workers require appreciably more sleep than the man who earns his living with his muscles. This is because it takes a longer time to replenish the nervous energy expended by brainwork.

And tests showed that we recuperate quickest from fatigue that is purely physical. Chronic worriers, on the other hand, are likely to wake up tired no matter how much sleep they get, for they squander mental and nervous energies faster than sleep can restore it.

3. **What is the healthiest diet?**

A well-rounded diet that is high in meat, fish, or other protein. A Pennsylvania State College health survey of hundreds of men and women showed conclusively that those of the group who ate the most meat made the highest all-round health scores. Other nutritional investigations have similarly shown that a high-protein diet pays the biggest dividends in terms of physical fitness and general health.

4. **What is the most important meal of the day?**

The one you eat when you get up in the morning. Studies have shown that a skimpy breakfast can sabotage your health, ruin your disposition, and seriously impair your daily efficiency.

Indeed, to do a half day's work on an almost empty stomach puts two strikes against you so far as physical fitness is concerned; this practice lowers body resistance and renders you much more subject to deficiency diseases. Besides, studies show that you can't "make up" for an inadequate breakfast by eating extra amounts at lunch and dinner.

A substantial breakfast, Mayo Clinic researchers have found, lays the basis for a healthy life. This should be followed by a light lunch and a leisurely dinner. Doctors agree that one of the prime causes of indigestion and resultant stomach disorders is eating under conditions of hurry and excitement.

5. **What about mental hygiene?**

This is far more important than most people realize. For authorities estimate that well over 50 percent of our physical complaints are emotionally induced. Investigators at the Monroe Clinic at Monroe, Wisconsin, made a 15-year study of this matter. Their findings may surprise you. Here is a list of some of the common symptoms of which people complain. Opposite each is the percentage of times physicians found the complaint to be emotionally induced:

Pain in back of neck	75%
Ulcer like pain	50%
Gall-bladder like pain	50%
Dizziness	80%
Skin rash	30%
Gas	90%
Headaches	80%
Constipation	70%
Tiredness	90%

6. **What part does worry play in health?**

Studies show conclusively that nothing saps health and physical resistance more than worry. You can eliminate most groundless worries — particularly about the state of your health. If you suspect something is physically wrong with you, arrange for a medical checkup at once. The odds are better than even that your

fears are groundless.

And if they're not, knowing the facts gives you a chance to do something about whatever may be wrong. Millions of persons have worried themselves sick over fancied ailments which a simple examination would have shown they did not have.

So far as your other worries and anxieties are concerned, a university study has shown that 40 percent of them are over things that never happen, 30 percent over things in the past, 22 percent over petty trifles—leaving only 8 percent of any consequence.

Take a careful inventory of the things you worry about. Jot each one down on a separate piece of paper and sort them into the above categories. If you're like most people, you'll find that more than 90 percent of your worries have no justification.

7. What is the best way to deal with the emotional tensions, frustrations and guilt feelings that make us feel under par?

One of the most effective formulas ever devised was developed by the late Dr. E. J. Kepler of the Mayo Clinic. Dr. Kepler observed the effects of various forms of therapy on hundreds of patients who, though they had nothing organically wrong with them, suffered from various aches and pains, felt chronically fatigued, and had lost the zest for life that goes with good health. He succeeded in determining the only means of treatment that the clinic found completely successful.

Diagnosis showed that each of the sufferers without physical cause was leading an unbalanced life. The prescription: Each patient was instructed to adjust his personal life carefully so that it was equally influenced by four things—work, play, love, worship (devotion to something greater than oneself). Each of these influences was to be equally dominant.

Where this rule was followed, case histories show no instance where chronic symptoms failed to disappear completely. Also, Dr. Kepler's records show no case when a chronic-fatigue sufferer's life was not decidedly lacking in balance. More often than not, at least one of the four factors was almost entirely absent from the lives of the chronically fatigued.

8. Is it important to keep busy?

Studies conducted by the University of Chicago show that people who keep the busiest are the ones who stay the healthiest. This finding has been borne out by other investigations. Indeed, psychologists have found that the individual who doesn't keep busy, who has too much time on his hands, tends to deteriorate fastest—mentally as well as physically.

His resistance to disease is lower. If he doesn't develop actual physical ailments, he's likely to imagine that he does—and suffer the aches and pains and general "poor health" of the hypochondriac. Why? It's simply a matter of morale. Doctors agree that morale is a key factor in health — and nothing saps it faster than idleness or nonproductive activity.

Says Dr. David H. Fink, psychiatrist: "Evidence all up and down the line bears out the fact that leading an active and busy life is one of the best forms of health insurance. It is often said that a machine will rust quicker than it will wear out. This is even truer of a man."

Lieutenant Orin D. Plooster

RECENTLY, I HAD an opportunity to see how an Army Accident Investigation Board pursued the task of investigating an aircraft accident which had resulted in two fatalities. I was shocked to learn that the board had not met nor visited the wreckage until after the deceased were buried three days later. It was easy to see that this unit had a pretty poor prior plan for accident investigation.

The purpose of this article is not to comprehensively relate how to investigate aircraft accidents but to emphasize the importance of what should be done prior to an accident and immediately after an accident occurs.

All aircraft accidents, no matter how minor, must be investigated. This investigation is not conducted just to determine what happened in any particular accident, but to determine cause factors which may be used as a basis for preventing other accidents. Because of the value of this information, we must properly plan for accidents and know what to do when an accident occurs.

To ensure that we know what to do before an aircraft accident occurs, we must have a good preaccident plan. The plan should consist of procedures to be followed by all personnel who are directly or indirectly concerned with rescue operations or the investigation.

Lt Plooster wrote this article while attending the University of Southern California Safety Course.

PREACCIDENT PLAN

At installations where the aircraft population warrants, a preaccident plan will be developed. The plan should provide for—

- Crash alarm system.
- Crash rescue plan. (Reference SR 95-50-1.)
- Plan for locating the wreckage and proceeding to the scene.
- Plan for guarding the wreckage to preserve evidence.
- Plan ensuring that adequate equipment is available to gather initial data.
- Appointment of an aircraft accident investigation board prior to the time an accident occurs. The board should consist of the most capable investigation personnel available to the appointing authority.
- Assignment of responsibilities for technical assistance to the investigator, to include—

Engineer
Signal Officer
Public Information Officer
Aviation Medical Officer—
(Flight Surgeon)
Chaplain
Transportation Officer
Provost Marshal
Safety Officer.

THE CRASH ALARM SYSTEM

Two components to the crash alarm system are the primary alarm circuit and the secondary alarm circuit. The primary circuit is used to notify those personnel who must depart immediately for the accident scene. Connected to the primary alarm circuit are the control tower, crash fire and crash ambulance station, crash helicopter station, crash boat rescue station, and operations. (Some installations may not have a crash helicopter or crashboat rescue station.) Their primary job, with the exception of operations, is the preservation of life and the preservation of evidence for the investigation. Each of these stations has specific jobs as listed in SR 95-60-1. Flight operations is on the primary alarm system only to initiate the secondary alarm system.

The secondary alarm system is not outlined in regulations, primarily because the duties and stations are highly flexible and will vary with the size of the unit and the number of organizations available. The reason for the secondary alarm system is to ensure that only essential personnel will be included at the scene of the accident.

LOCATING AND PROCEEDING TO THE WRECKAGE

To ensure that concerned personnel get to the scene as soon as possible, a grid map should be available of the airfield and the surrounding area for at least a 15-mile radius. It should be constructed so that any point in the entire area can be easily located. It should be kept current and posted in several places on the airfield. Each unit or individual in the crash alarm system should have a copy and one should be placed in each rescue vehicle.

Departure for the scene of the accident should be in an organized manner. This means that two separate groups will depart. The first group will be the crash rescue group included in the primary alarm circuit. They will depart as soon as possible in a previously planned manner.

Personnel of the secondary circuit should meet at a predetermined location and proceed to the crash scene in a convoy.

GUARDING THE WRECKAGE

An important part of the preaccident plan is preserving the wreckage for investigation purposes. Military guards should be used if possible. Civilian guards can be used until military guards are available. The primary purpose of guards is to ensure that the wreckage is not disturbed nor evidence destroyed. The guards should be thoroughly briefed on their duties and should be properly clothed, fed, and relieved at reasonable intervals.

ACCIDENT INVESTIGATION EQUIPMENT

In order to start the investigation as quickly as possible, the investigator should ensure that he has enough equipment and the proper clothing to do his job. He should wear comfortable working clothes of the proper weight as he will be apt to get quite dirty. Gloves are a must; he will be handling broken metal and glass parts that might be damaging to the hands.

The investigator should have an accident investigation kit that contains items necessary to carry out the investigation. The following basic items should be included in all accident investigation kits:

- Magnetic compass
- Steel measuring tape (50-100 feet)
- Protractor with scale
- Paper and pencils, including grease pencil
- Maps and/or charts
- Graph paper
- Shipping tags for identifying parts
- Containers for fuel and oil samples
- Suitable hand tools, in-

cluding knife
- Flashlight with extra bulbs and batteries
- Magnifying glass
- Heavy twine
- Camera with flash bulbs
- Appropriate airframe and engine publications and operating handbooks
- Portable tape recorder
- Models of various types of aircraft (painted and marked in the same manner as the aircraft they represent)
- Snake-bite kit, in areas where poisonous reptiles are prevalent
- DA forms for accident reporting

Other items may be necessary, depending on the terrain, weather, location, aircraft type, and the nature of the accident.

Now that we have learned what to do before an accident happens, let's see what we do when an aircraft accident occurs.

As soon as the investigator arrives at the scene of the accident he must take quick and decisive action to ensure that the investigation will be conducted efficiently. To do this, the investigator should follow certain initial procedures to determine the general nature of the accident.

The investigator at the scene of the accident normally will proceed as follows:

- Give first priority at a crash to the rescue of personnel. Only aid in the preliminaries of first aid when called upon to do so or when reaching the scene of the accident ahead of medical officer and hospital attendants.
- Take necessary steps to secure the wreckage against scavengers, making sure the wreckage is not moved or tampered with.
- Obtain names and addresses of witnesses whose information will aid in the investigation.
- Obtain an inventory of major parts.
- Make a wreckage diagram paying particular attention to marks made by the wreckage that may not be there later.
- Arrange the proper coordination for issuing information to the press.

The two most essential components of the investigation are the witnesses and the wreckage. Therefore, it is essential that as much information be gathered from these two sources as possible.

To discover the general nature of the accident, the investigator should make an initial inventory of parts to determine if the aircraft arrived at the scene intact or whether structural disintegration occurred in flight.

While the investigator is making this inventory he should also make a wreckage diagram showing the relative location of the major parts. Particular notation should be made of (1) point of initial contact, (2) location of the injured or deceased personnel, (3) location of all major portions of the aircraft, (4) location and size of propeller marks or impact marks, (5) weather conditions, and (6) prominent terrain features or obstructions that may be pertinent to the crash.

One of the most important steps in the investigation is gathering information from the witnesses who saw or heard what happened. It is, therefore, highly important to locate these witnesses as soon as possible. If a witness is not located immediately after the accident, he will have time to compare his story with someone else, which will result in distorted evidence. The investigator should locate as many witnesses as possible and get a brief statement from each. The witness can always be revisited if more information is needed.

Compliance with the ideas expressed here will not give you an adequate preaccident plan; nor will you be able to adequately investigate all accidents. These are only a few of many factors which must be considered in preparing for correct procedures in accident investigation. A close look at your own operation will determine if you have p. p. p. p. (pretty poor prior planning) or if you have utilized P! P! P! P! (Prior Planning to Prevent Problems).

Portions of this article have been excerpted from DA Pamphlet 95-5, "Handbook for Aircraft Accident Investigators." Consult this pamphlet for complete preaccident planning and accident investigating information.—Editor

New Assignment?

Don't forget to send a change of address card to the Supt of Documents, GPO, Washington 25, D. C., if you subscribe to the DIGEST.

you

The primary source of material for the DIGEST is from YOU the reader. Although our staff produces material on special topics, we unfortunately cannot make as many visits to CONUS units and activities as we would like to gather material. And we have no source of overseas material except YOU.

Much good material exists right in your unit or activity. YOU may consider your idea old hat, but another unit may be doing the same job the hard way.

Items of interest are frequently overlooked, considered of no interest, or not written about because the persons concerned think they can't write. The DIGEST welcomes the opportunity to turn a rough draft into a finished article.

People are using Army Aviation everyday to accomplish their missions. New ideas are suggested, tried, and put into practice without fanfare—and without any other unit learning about it. For example, a recent visitor to our office told how his unit had tested a new hoist system on a Sioux. The hoist could be used to evacuate injured personnel from an otherwise inaccessible area, or it could be used to lower a medical corpsman to help a party on the ground. These are just two of the many applications of such a rig. Possibly only the people directly attached to this unit will ever hear the details of this experiment unless the results are sent to a magazine for publication.

At least one commanding officer requires every officer in his command to submit an article for publication. (We received and printed 3 articles from this unit in 1961 and have 2 scheduled for publication in 1962.)

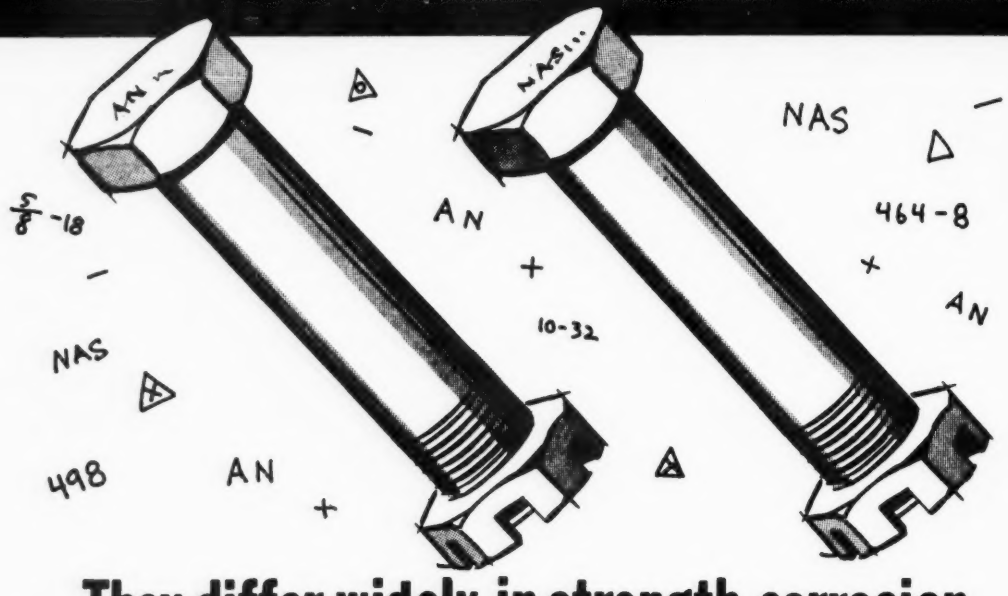
If you are aware of something of value to others in our program—a personal experience, idea, or suggestion — please submit it to the DIGEST. We depend on YOU, our reader, to help us produce a magazine of high reader interest and value.

If a personal experience, idea, suggestion, etc., in the DIGEST has ever been of value to you or your unit, REMEMBER—it was submitted, in all probability, by someone just like you. If he can write for publication, so can you!

We want your contributions —large or small, with pictures or without them. Address them to: Editor-in-Chief, U. S. ARMY AVIATION DIGEST, USAAVNS, Ft. Rucker, Ala. Your contribution may also win you $50, $75 or $125 in the Annual Writing Awards Contest!

YOU have the ideas and knowledge. **WE** have the space and editorial savvy. **TOGETHER** we can produce a magazine with a high reader interest of value to everyone in the Army Aviation Program.

They may look alike-but...



They differ widely in strength, corrosion resistance and ability to withstand temperatures.

Do YOU know material identification marks?

Courtesy of Flight Safety Foundation Inc.

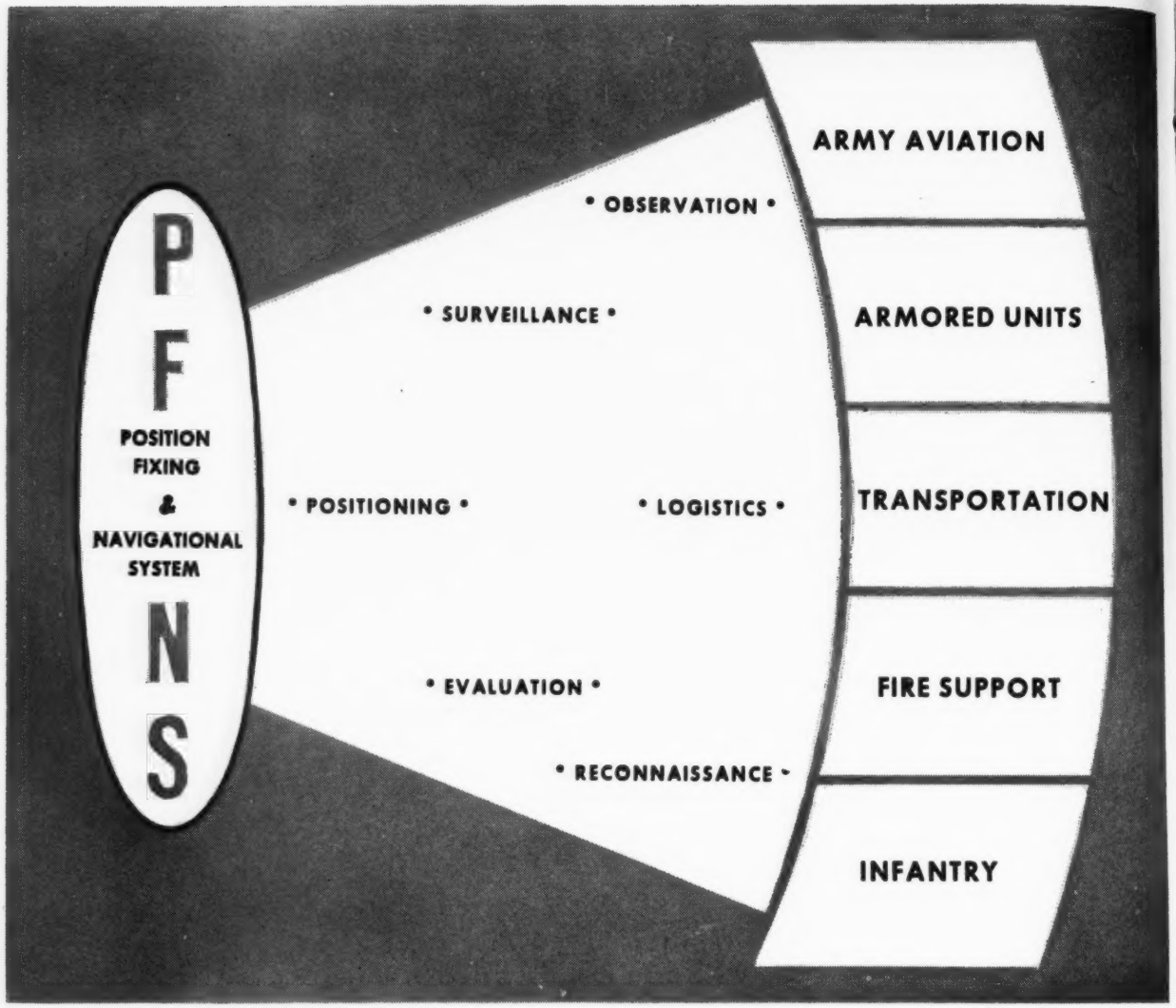
BOLTS

Steel AN bolt
125,000 PSI
Close tol. steel AN bolt
125,000 PSI
Corrosion resistant
Steel AN & NAS bolts
Close tol. cor. resistant
Steel AN bolt (Inactive for new design)
Alum. alloy AN bolt
Close tol. alum. alloy
AN bolt (Inactive for new design)
Close tol. steel NAS 464
160,000 PSI
Close tol. steel NAS 464
Shear bolt
Close tol. steel, NAS 1103-1120
Short thread 160,000 PSI
Close tol. steel, NAS 1303-1320
Tensile 160,000 PSI
NAS 380
Two staggered parallel dashes denotes corrosion-resistant steel
NAS 380
Recessed triangle denotes close-tol. shank/head
NAS 380
R Denotes rolled threads after heat treatment
NAS 380
= On bolt or screw head denotes bronze material

MOST BOLTS used in aircraft structures are either general purpose AN bolts, or NAS (National Aircraft Standard) internal wrenching, or close tolerance bolts and are marked for identification purposes as required by the applicable standard drawing. These identifying marks are shown on this page. In addition, the bolt manufacturer may include his identification marking on bolt heads.

In certain cases, where dimensional or strength requirements necessitate, aircraft manufacturers are compelled to make up special bolts of different dimensions or higher strength than the standard types. These bolts are made for a particular application and it is of extreme importance to use like bolts in replacement.

Such special bolts have the part number stamped on the head. When the head is too small for stamping the number, the notation "SPL" (abbreviation for special) shall be stamped on the head.



Major John A. LaMontia, USAR (Ret)

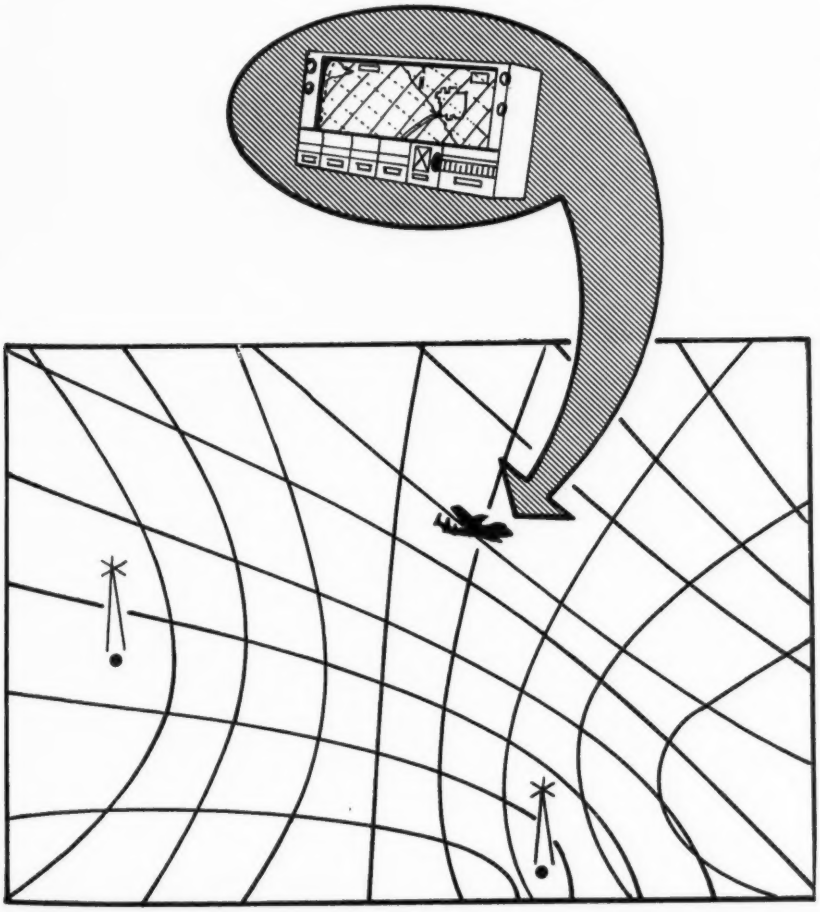
LONG BEFORE man learned to fly he had learned that getting from one place to another without becoming lost was quite a problem. The position relationship between "here" and "there" was very difficult to figure out unless the route of travel was very familiar and fairly short. Then when the flying machine came along, this problem of position fixing and navigation became even more obvious and needful of solution.

Back in the early days of barnstorming, when flying was done with goggles, white scarves, and the seat of the pants, various methods of position fixing and navigation were excellent topics for "hangar flying," but for little else. Soon, however, with more and faster aircraft filling the sky, the need for a pilot to know his exact location and how to get to his destination became an urgent matter. The military pilot in particular has a very special need for position fixing and navigation information.

Maj LaMontia is with Liaison and Applications, Military Navigation Systems, The Bendix Corporation, Bendix-Pacific Division.

The PFNS system is useable by all types of Army field units, including foot soldiers, ground vehicles, and high performance aircraft

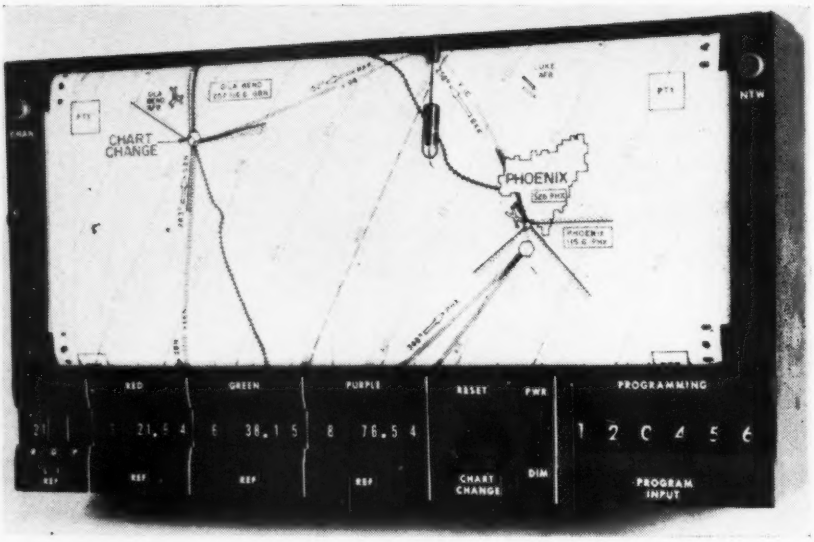
The system is based on a ground radio transmitting set of four stations which radiate an electronic grid pattern covering the area of field army responsibility



This is a vital tool of tactics to meet an endless variety of conditions in a constantly changing combat environment.

The increasing necessity for a reliable positioning and navigation instrument soon gave birth to all kinds of devices. An incomplete but somewhat historical list includes bonfires, en route lights, nondirectional transmitters, four-legged ranges, visual-omni-ranges, and radar. Each device led to further progress. In recent years specialized radar equipments, charts, and various other visual display types of equipment have been devised which gives the pilot a "picture" that bears some resemblance to the terrain over which he is flying. All these visual type equipments are generally classified as pictorial display systems.

One of the most recent advancements in pictorial display is a system now being fabricated by Bendix-Pacific Division, The Bendix Corporation under contract to the United



Stylus pinpoints aircraft's position on moving map

States Army Electronic Proving Grounds at Fort Huachuca. This system, labeled PFNS (Position Fixing and Navigational System — pronounced piffins), will soon be available to Army Aviation for evaluation. It is scheduled for delivery to Fort Huachuca early this year.

The equipment to be delivered for evaluation includes receiving systems for wheeled and tracked vehicles, manpacks for the foot soldier, systems for aircraft, and is useable at speeds up to 750 knots.

The PFNS system provides the pilot with a clearly visible moving map of the terrain below him. This map is mounted in the cockpit directly in line with the pilot's normal area of vision. The moving map represents the terrain over which the aircraft is flying. A stylus representing the aircraft automatically pinpoints the aircraft's position with uncanny accuracy.

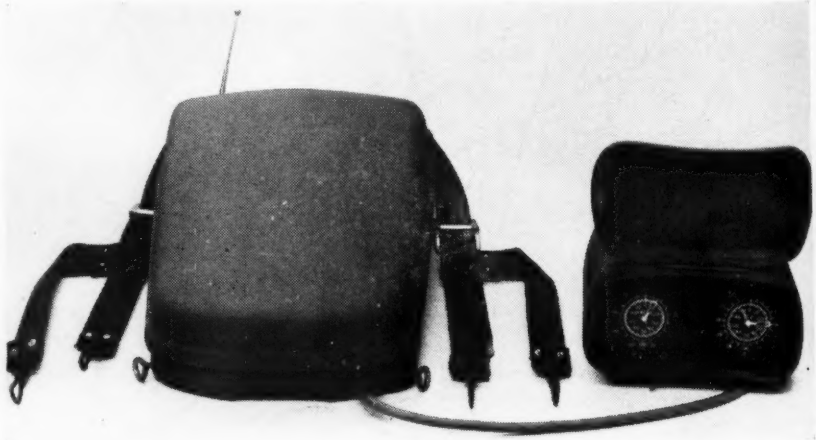
PFNS, which does not depend on line of sight, is a low-frequency, area coverage, position fixing and navigation system which, for all practical purposes, reduces the terrain to fit right inside the pilot's cockpit. The pilot merely "flies" the stylus over the map — just as he would fly the aircraft over the ground.

This is an area coverage system which does not require transmitters to be located near or on the point of intended termination of flight. The operating coverage spreads over an area of 150,000 square miles. Its low-frequency characteristic eliminates the stringent limitations associated with line-of-sight aids. The system is reliable on the ground, in valleys, behind buildings, hills or mountains. Its effective altitude coverage is unlimited.

The aircraft system will offer two methods of utilization. One is manual plotting, whereby a continuous set of coordinates is read out to the pilot for reference to a map. The second method utilizes a moving map of the terrain with a stylus representing the aircraft's position.

The stylus may inscribe the track made good for a permanent record of the flight, if this is desired. Pilots will be able to see designated holding patterns on the display. It will not be necessary for him to enter into mental gymnastics usually required for computing time outbound, time to turn, and other such factors. Pilots flying a tactical mission requiring treetop navigation will be able to see their present position and route ahead. Enemy concentrations may be plotted on the cockpit display and the

PFNS aircraft receivers are compatible with Army weight requirements. Manpack receivers (shown) weigh 21 lbs.



stylus and aircraft flown around potential enemy groundfire.

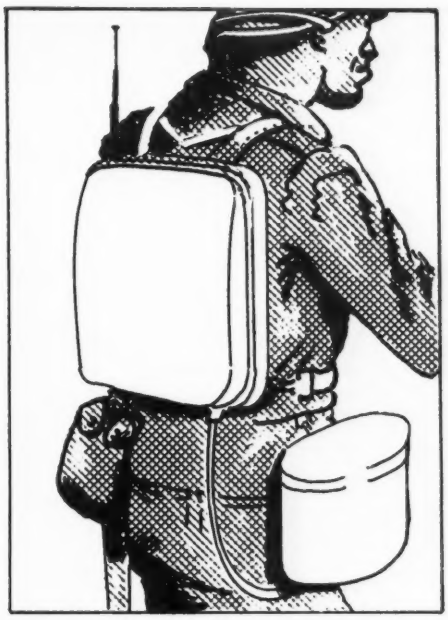
Night flights may be conducted over a completely blacked out area while the pilot has in front of him a "picture" of the ground below him.

Helicopter vertical envelopments may be conducted with safe close lateral aircraft separations at treetop altitudes. Flying to and from the drop zone will be a relatively simple task of "flying" the stylus within a specified corridor which will be plotted on the cockpit display.

One of the greatest advantages of the system is its utilization in air traffic control. Airways may be changed or altered in a few minutes without concern to repositioning ground transmitters. Reporting points and holding patterns may be added or deleted at the discretion of ATC without significant thought to transmitter location. Because of the system's nondependence on line of sight, ATC can control the entire area for a field army from ground level up.

Weight is always a prime consideration in airborne equipment. PFNS receivers are lightweight and compatible with Army weight requirements. Manpack receivers for the foot soldier weigh 21 lbs. Transmitters are completely transportable by light cargo helicopter and can be erected, ready for operation, in less than 4 hours. It can be dismantled in 2 hours.

A unique system of leapfrogging the transmitting stations permits operation for an indefinite period of time to provide continued coverage during a breakthrough or fast moving



combat situation.

One chain of transmitting stations will provide en route and terminal guidance facilities to every point within a 150,000 square mile area. In fact, using the Korean operations as an example, one set of transmitters would give coverage over most of the entire peninsula. This would permit every airfield, including company level helipads, to have en route and terminal aid navigation facilities.

Flying Time Limits for Rated Crew Members

Department of the Army Circular 95-4, 15 November 1961, provides commanders with guidance in establishing maximum flight time limits for aircraft crew members.

While reliable flight time maximums cannot be established for all circumstances on the basis of data available at DA, the following limits are suggested as guidelines for establishing maximums under normal operating conditions:

- Fixed wing aircraft flight time—25 hours per week with a maximum of 80 hours per month.
- Rotary wing aircraft flight time—20 hours per week with a maximum of 70 hours per month.
- Combined fixed and rotary wing flight time —20 hours per week with a maximum of 80 hours per month.

Further guidance is furnished in the circular.

STRENGTH in Reserve: Army Aviation

Sp-5 Robert E. Lee

A SHORT WHILE AGO the average citizen knew little about the local Army Reserve units, but as many of these units were activated and moved into fulltime military service he became acutely conscious of our citizen soldiers and their training units. Many who left for active duty were those with whom he dealt on a day-to-day basis, but he had never realized they were members of Reserve units.

But even before the recent callup occurred a new look was coming into the Reserve program as farsighted leaders and active military advisors realized the growing importance of these organizations to the defense of our nation. Many units had already trained to a high state of readiness. Others were busy filling in with needed equipment, personnel, and stepping up training requirements.

Today the Army Reserves are getting more and better equipment than ever before. If activated, they can be expected to complete their mission as efficiently as the Regular unit.

Aviation units are an important part of the Army Reserve program. As a rule these units are organized under the same TOE as the Regular Army unit. Even with the great strides made by Reserve components during the past few years, some problem areas exist: personnel procurement, and equipment and facilities for sound training. None are insurmountable, but overcoming them does require considerable planning and work. The primary problem besetting most Reserve aviation units is that of personnel procurement.

The procurement problem is not just one of enlisting "bodies" but in locating **qualified** personnel. And the problem is far more acute in obtaining qualified enlisted personnel than officers.

Enlisted personnel usually enter the Reserve Army Aviation unit either as 2-year inductees or as a result of the Reserve Forces Act (RFA). The inductee has 2 years of active Reserve obligation left after completing his tour of active duty. During that 2 years he can be of much value to the unit through instruction, supervision, and the knowledge that he brings with him. If he can be induced to reenlist he can continue to be of great benefit to the unit.

The RFA entry is usually enlisted locally and sent on active duty for 6 months training. He is recommended for training in three MOSs, preferably those needed within the unit. After he gets to the Basic Training Center he is given the battery of tests for determination of which MOSs he is best qualified. He may not be qualified for any of the recommended MOSs.

Assuming that he is qualified, after basic training he is sent to a service school. By the time he completes his schooling, most of his 6 months active duty is completed, and he returns to the unit schooled but with no practical experience.

Individuals not sent to a service school for instruction are sent to an aviation unit for on-the-job training. This method of instruction, if coupled with a sound academic course, is excellent. (Within Reserve units such an on-the-job training program can be used. The Army has made available to the Reserve units ample training aids, lesson plans, and publications. The only requirements are time and good instructors.)

As for time, the reservist is available for training approximately 48 drills per year, providing he attends all of the assemblies. Thirty-six of these drills are of 2-hour duration and 12 are of 8-hour duration. When all of this is added to the 15 days annual active duty, he is available for training 232 hours per year. (Contrast this with almost 2,000 hours per year for Regular Army.) With the intervals between instructional periods, retention of information is a problem. Training received at the first of the

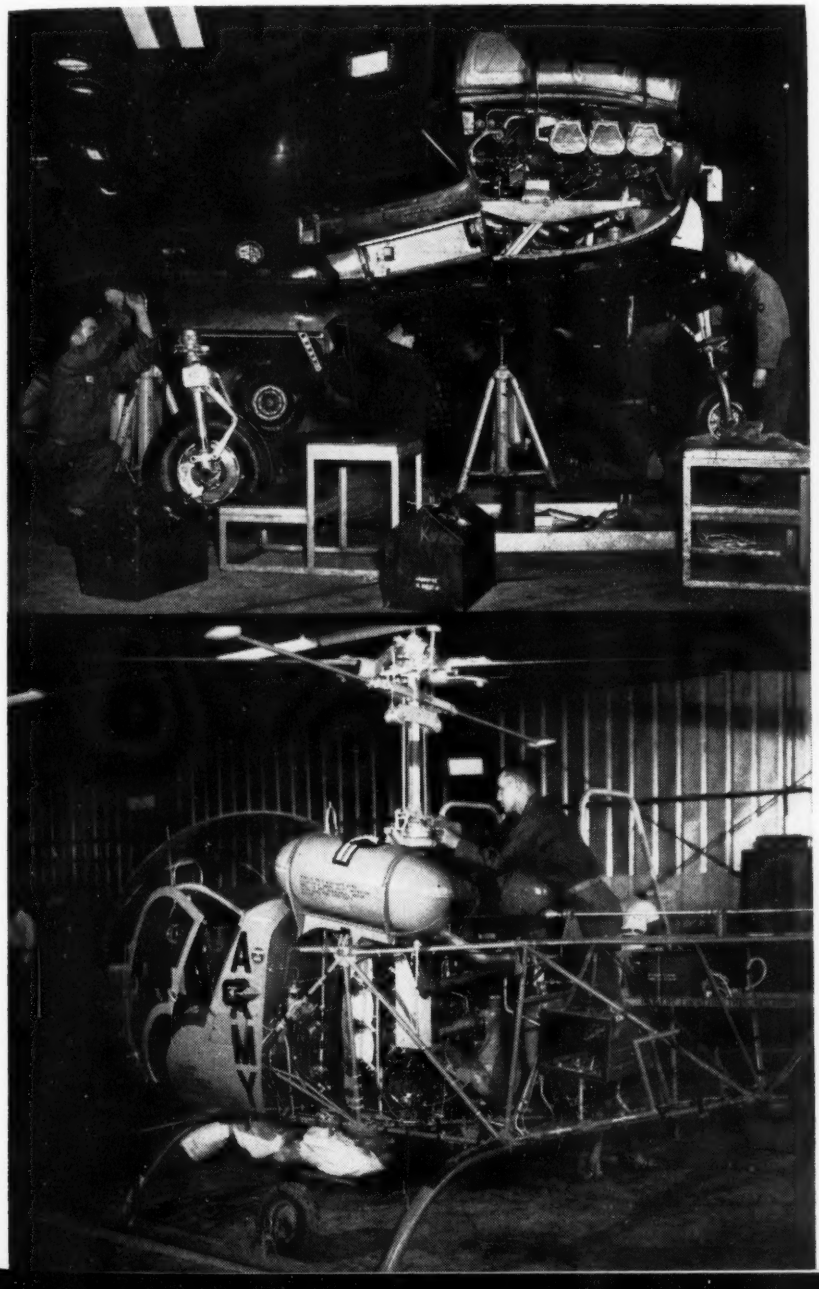
Sp-5 Lee is aviation advisor to the 218th Trans Co (AM) (GS), Columbus Subsector Command, Columbus, Ga.

year is sometimes forgotten by the end of the year. Unfortunately, by the time the trainee becomes qualified in his MOS, his Reserve obligation is completed and he is discharged.

One possible solution to this problem is to divide each drill period into two sections. The first section is devoted to academic instruction; the last to practical work in line with the first period of academic instruction. Not as much instruction will be "dished out" during the year, but more knowledge will be retained by the trainee.

Within our unit we are fortunate in having an arrangement with the commander of the local Army airfield that provides on-the-job training one night per month with a comparable Active Army unit on the field. During this period, the Active Army unit performs normal maintenance on their aircraft while the reservist works along with them.

On-the-job training with an active Army unit conducted simultaneously with academic instruction offers a possible solution for an effective reserve training program



For example, our technical supply personnel work in technical supply, the unit electrician works in the electrical shop, the fixed wing mechanics work on fixed wing, the rotary wing mechanics work on helicopters, and so on through the entire unit. All of this activity is presided over jointly by the maintenance officers of both units. A band of engineer tape on the cap of the reservist helps to identify him for accounting purposes.

It must be realized that this arrangement, though very beneficial to the overall program is not so beneficial to the Active Army unit, if looked at on a short range basis. Much easier for the Active unit to see is a slow down in work production, and a possibly dangerous situation imposed due to inexperienced personnel working on their aircraft; but with sound supervision this hazard is minimized. By this method the Reservist not only gets academic instruction but is also able to actually perform the tasks that he only knows about from the classroom. The slight sacrifice in speed of maintenance is more than offset by the increased readiness of the Reserve unit in time of need. As a result, aiding and assisting these Reserve units to become better trained and ready is of prime importance to the Active units. Also, active units have increased confidence in the abilities of Reserve units. Such cooperation at a working level truly demonstrates the "One Army" concept in action and ensures a better state of active duty readiness by Reserve units.

Hanchey Army Airfield-No

Already the world's largest heliport, Hanchey Army Airfield recently has added a new stagefield and an ultra modern instrument and procedural training building. Hanchey is headquarters for the U. S. Army Aviation School's Department of Rotary Wing Training.

Figures 1 and 2 give an aerial view of the developments and additions at Hanchey AAF since 1959 and reflect the growth and success of the Army's rotary wing program. Figure 1 shows Hanchey just after its completion in the fall of 1959 (see DIGEST, Jan 1960), and figure 2 shows Hanchey as it appears today.

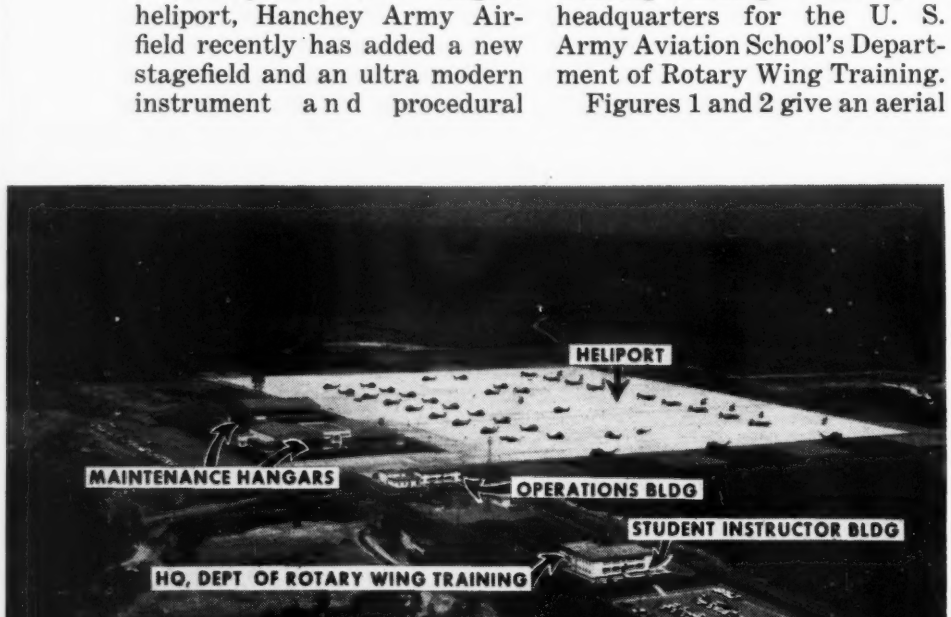
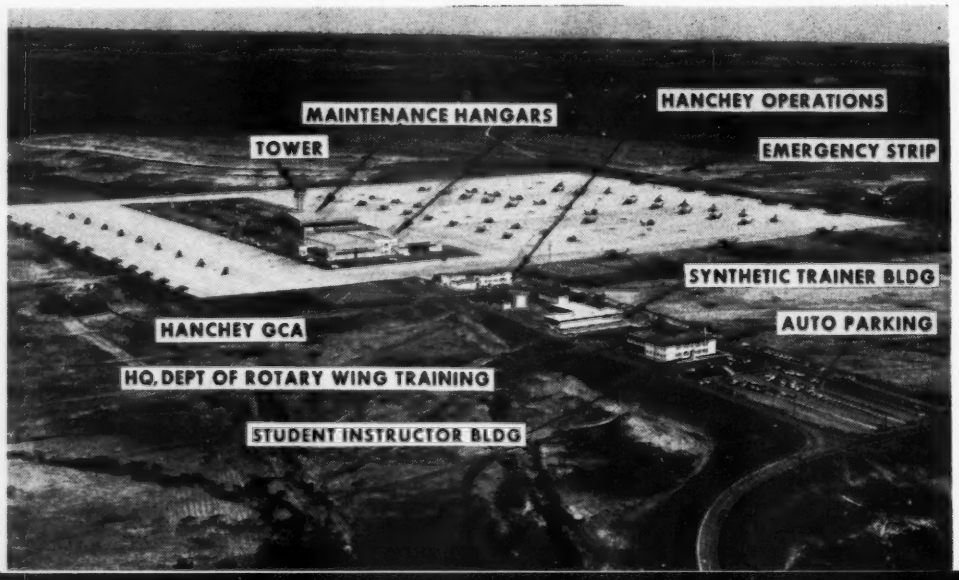


Figure 1

Figure 2



The instrument and procedural training building is designed to accommodate sixteen 2B3 helicopter synthetic instrument trainers and ten H-21 and H-34 procedural trainers. This building enables students to remain at Hanchey for all flight instruction rather than travel 5 miles to the main post where the trainers were previously located.

The new stagefield was named Hunt Field in honor of Major William P. Hunt, Jr., who was killed in action in Korea and posthumously awarded the Distinguished Flying Cross. Hunt Field (fig. 3) has four lanes and a permanent control tower. It is designed to accommodate all helicopters and fixed wing aircraft.

Originally, 258,088 square yards of concrete was poured to build the heliport at Hanchey. Recently the automobile parking lot west of the maintenance hangars was moved to parallel the road approaching the field from the south, and 55,414 square yards of concrete was poured to extend the apron around and to the west of the hangars.

World's Largest Heliport

Hanchey AAF is still growing. An additional 150,417 square yards of concrete is programmed for the west apron. This will accommodate the growing Iroquois and anticipated Chinook fleets. Additional lighting facilities, and two new hangars are planned for the near future.

Other noticeable changes at Hanchey since 1959 include the removal of the heavily wooded areas surrounding the field and the installation of the Hanchey GCA (fig. 4). The Hanchey GCA has proved highly successful and has been certified by the FAA.

The average number of students at Hanchey at a given time has risen from 100 to 145 since Hanchey opened. Courses of instruction are:

- Officers Rotary Wing Aviator Course, phase 2,
- Warrant Officers Rotary Wing Aviator Course, phase 2,
- H-37 Helicopter Pilot Transition Training Course,
- HU-1 Instructor Pilot Transition Training Course,
- Army Aviation Medical Officers Orientation Course,
- Helicopter Instrument Flying Course,
- Helicopter Instrument Flight Examiners Course.

The latter two courses were inaugurated in mid-1956. Since then and to date **rotary wing students have logged over 24,000 hours of hooded flight and over 1700 hours of actual instrument flight without accident, incident or flight violation.** This is an outstanding accomplishment and a credit to Army Aviation. The many people responsible for this achievement rate a "well done."

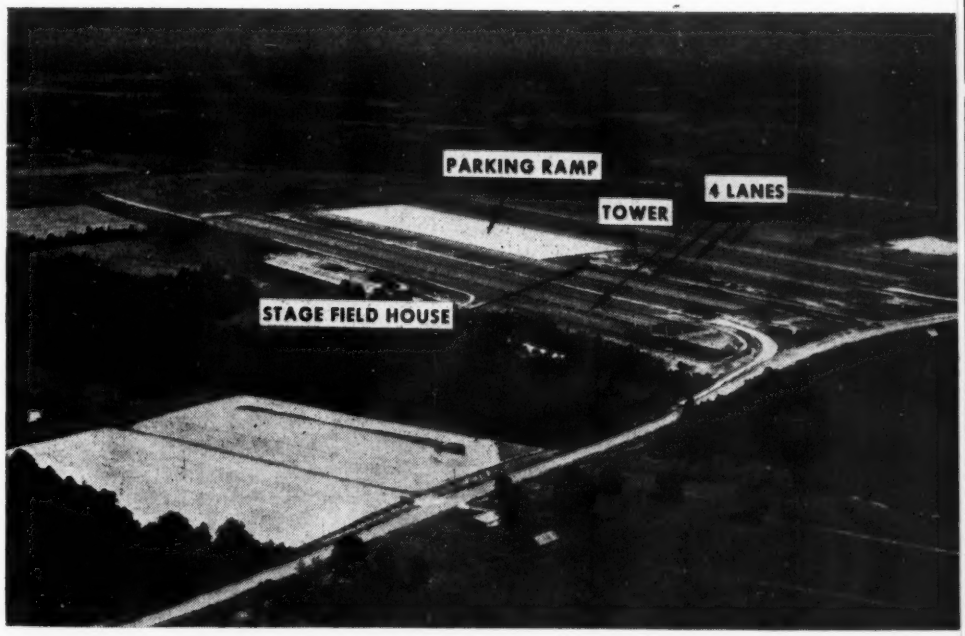
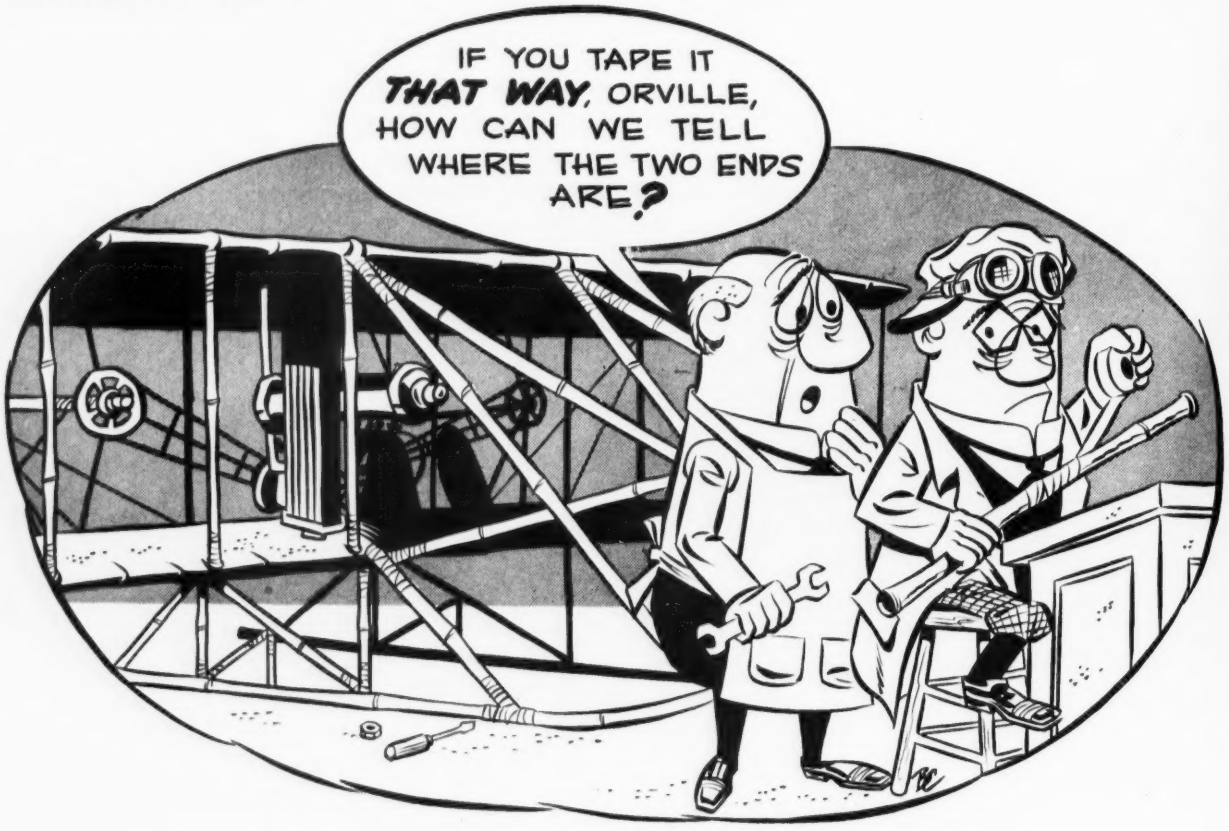
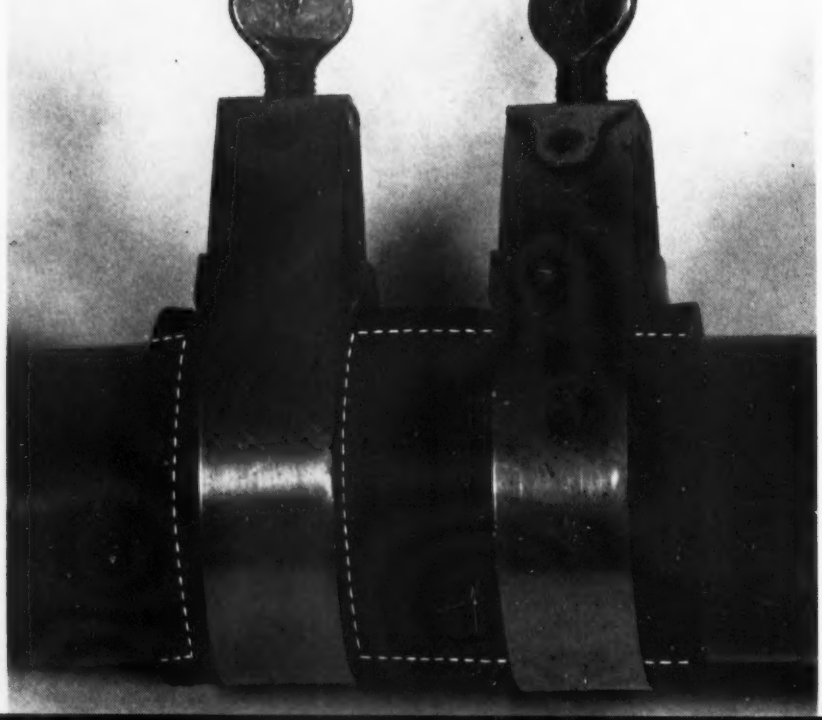


Figure 3

Figure 4



MURPHY'S LAW



THE ACCIDENT

An H-13E was on the second leg of a cross-country flight. After approximately 25 minutes of low-level flying, its engine failed. The pilot attempted to flare and the Sioux crashed into the trees. It hit the first tree in a slight nose-high attitude, continued on and struck the second and third trees. As

Left: Button, button — who's got the button?

Side view shows angle of impact and collapse of front end

it slammed into the fourth tree, the aircraft turned 180° and fell to the ground at an angle of 80°, nose down.

It was estimated that vertical forces during the crash were in the range of 25 g. The 249-pound passenger was thrown against his safety belt with such great force that it stretched the webbing of the belt. He was hit in the chest by the right cyclic stick, which was pushed upward, backward, and slightly to the right during the crash sequence. This blow caused a fatal injury.

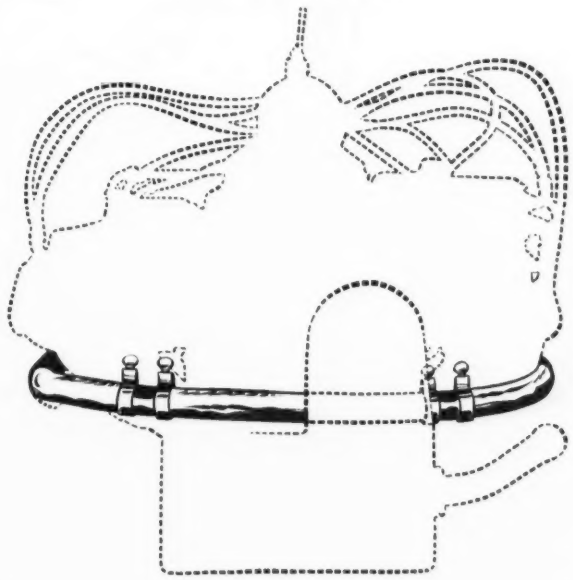
The pilot sustained a concussion and three spinal fractures. He had complete amnesia from the moment of impact until he awakened in a hospital the following morning. What he remembered of the flight was given in his own words:

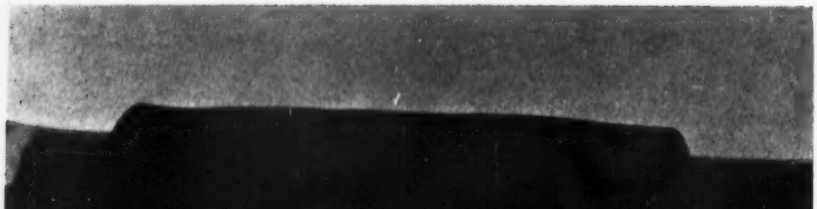
"I remember nothing eventful on the first leg of the flight to _____, where we stopped to refuel. I vaguely remember there was some kind of problem on the refueling, but what it was I don't know. I do not remember what time we departed _____. Some time later, I remember a rapid, steady loss of power, and hitting trees. The next thing I remember was waking up in the hospital."

Investigators at first suspected fuel contamination, but analysis of a fuel sample proved this a false lead. The next step was a tear down inspection of the engine. To accomplish this, the engine was flown back to the manufacturer, accompanied

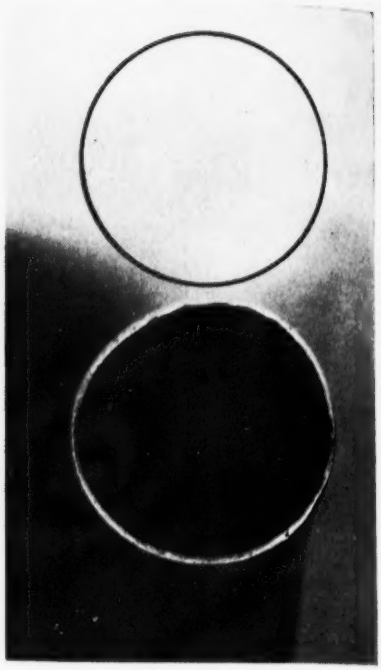
Cyclic stick handle cracked by impact with passenger's chest

Equalizer tube connects intake manifolds at bottom of engine

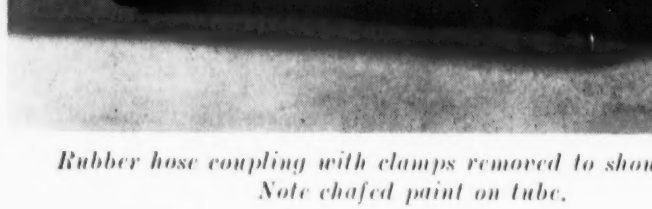




Rubber hose coupling with clamps removed to show opening. Note chafed paint on tube.



Equalizer tube end. Note oval shape.

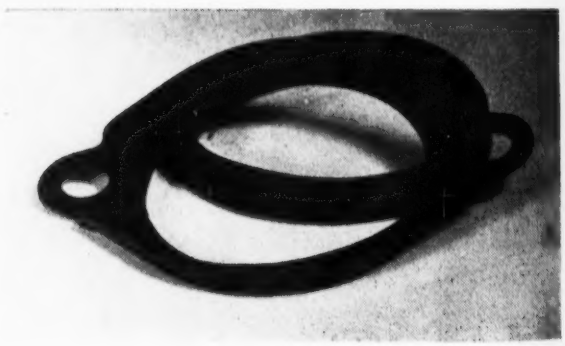


Type clamp used on rubber hose couplings

by an operations and maintenance sergeant from the Investigation Division of USABAAR. Here is what they found:

Visual inspection of the engine revealed that the intake manifold equalizer tube was disconnected at one rubber hose coupling.

All four rubber hose clamps showed evidence of looseness. Paint was chafed away at the connections by hose movement. There was also wet evidence of fuel at these connections.



Flange connects flared ends of equalizer elbow tubes to intake manifolds

Spark plugs from number 5 cylinder. Note fused electrodes.

At the point where the equalizer tube was disconnected, the tube end was found distorted to an oval shape.

This distortion was most probably caused by overtorquing of the type hose clamp used.

Flared ends of the equalizer elbow tubes showed signs of fuel and air leakage where they connected to the intake manifolds. The flared surfaces were distorted, probably by unequal torquing of flange bolts.

This series of induction system leaks allowed free air to pour into the intake manifolds and cause an excessively lean mixture.

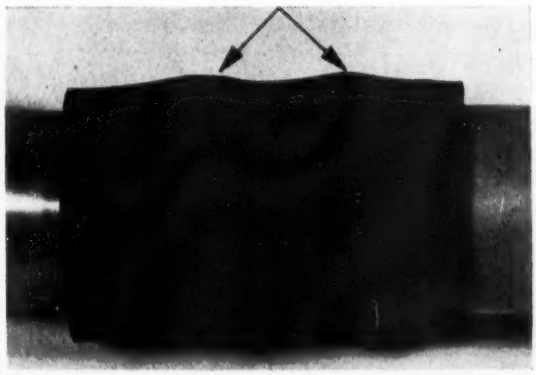
The lean fuel mixture created higher and higher temperatures within the cylinders. High temperature caused a breakdown of spark plugs. It became so hot in number 5 cylinder that copper melted out of the center of the spark plugs and fused the electrodes together. Failed spark plugs caused the engine to run rough and vibrate. High temperature also caused valve stems to expand. An exhaust valve stuck because of this and caused the engine to backfire. Either the vibration or the backfire, or a combination of both, caused the equalizer tube to separate. When this happened, the fuel mixture became too lean to support combustion and the engine failed.

Like Orville's two pieces of bamboo, once the equalizer tube assembly is put together, it is impossible to tell where one end of the tube ends and the other begins without removing the rubber hose couplings.

Can this Murphy be eliminated?

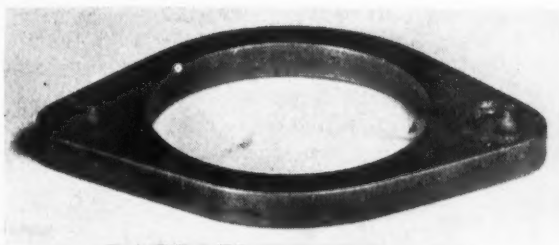
These new parts show great promise:

A new type of equalizer tube has beaded ends which provide greater strength, closer fitting with rubber hose couplings, and —



Ease of inspection. Note ridges in rubber hose coupling

New type tube with beaded ends



New solid flange ensures more evenly distributed torque

New type hose clamp gives evenly distributed pressure around rubber hose couplings and lessens chance of tube distortion

IT COULD HAPPEN TO YOU

Training Division
Libby Army Airfield
Fort Huachuca, Ariz.

Editor-in-Chief
U. S. Army
Aviation Digest
USAAVNS
Fort Rucker, Alabama

Dear Sir:

Flap malfunctions are not covered in the Emergency Procedures of the L-23D Handbook. Because of their normally faithful operation, a failure would likely catch many pilots by surprise. I am convinced that the aircraft is not controllable unless the flaps are raised to cruise position.

A UER was submitted on this incident, and this installation has since put cotter keys in the flap track bearing bolts.

Sincerely,

ELDON F. SAMPSON
Capt, SigC

WHILE TRANSITIONING a student in the L-23D, the following near-accident occurred. After reaching minimums on a TVOR approach about one-half mile out, I instructed the student to remove his hood and complete a straight-in landing. The gear had been lowered on procedure turn so he lowered flaps from cruise to about 10°, reduced manifold pressure to about 20" Hg, and lowered flaps to 20°, with airspeed about 100 knots. At this time, the right wing dropped about 20°.

My first thought was turbulence or a dust-devil, which are prevalent in this area. When the student did not pick up the wing, I got on the controls and found that he had full left rudder and aileron applied and was still unable to prevent a turn to the right. At this time we were only about 75 feet to 100 feet above the ground, approaching the overrun. I applied power, but the condition became worse. It was impossible to stay lined up with the runway.

The student thought I had given him a single engine. I decided against raising flaps because of our low altitude. Something had to be done, even if it were wrong, so I feathered number 2 engine, although all the engine instruments indicated normal. Immediately we gained sufficient rudder control to get back on centerline, reduce power and land without further difficulty.

Number 2 engine checked out perfectly upon restarting. The resulting writeup would have had the maintenance officer tearing his hair out. Finally came the dawn! Try lowering the flaps. Three of them lowered; the right hand outboard did not. The bolt that holds the outboard flap track roller in place had left us in flight!

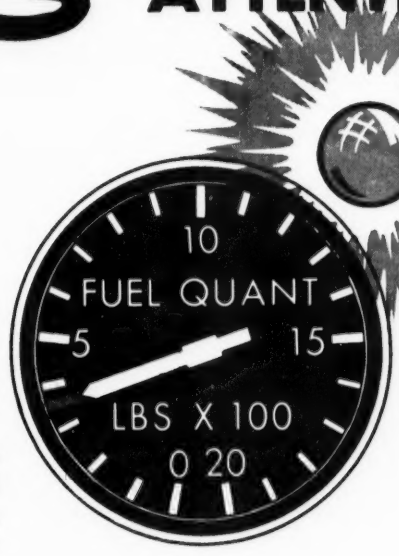
Why did feathering of the right engine help? It probably did not. I think that at about the same time, we were slowing airspeed and reducing power enough to regain control. Perhaps more experience would have shown me the way. Of course the solution is raise the flaps and add power as needed to prevent settling. Simple, isn't it?

To prevent accidents, commanders must recognize potential accident causes. Accidents are caused by definite unsafe conditions such as an unguarded machine, a defective piece of equipment or an improper action of a person.

From The Desk Of Grasshopper

Gus

ATTENTION H-21 PILOTS



HEY, YOU H-21 JOCKEYS! How much flying time left? — 20 minutes? — 40 minutes?

'cording to the -10, it oughta be 20 minutes at METO — all you should be usin' in flight, bub — power, or about 40 minutes at cruise settings — 2400 rpm and 33" Hg.

But is it?

One pilot thought so. His fuel reserve warning light came on during a night flight when he was about 11 - 12 minutes from destination. Nine minutes later, the engine coughed and died from fuel starvation. During the forced landing, the Shawnee crashed through trees and came to rest on its right side — damaged to the tune of $60,000. THE FUEL QUANTITY GAUGE READ 250 POUNDS AFTER THE CRASH. These lads were lucky and escaped with no injuries. A similar crash a few years back took two lives.

The -10 contains this

WARNING

"Malfunction or incorrect calibration of the fuel quantity gauge will result in a misleading indication by the fuel reserve warning light, since the light is actuated by the pointer on the fuel quantity gauge. Check the operation of the fuel quantity gauge periodically during flight to ensure that it is functioning properly."

Reading this, you'd be led to believe that checking the operation of the fuel quantity gauge would assure an accurate indication by the fuel reserve warning light.

NOT SO! CHECKING THE FUEL QUANTITY GAUGE IN FLIGHT ONLY TELLS YOU WHETHER THE FUEL QUANTITY GAUGE NEEDLE IS FUNCTIONING, IT IS NOT — REPEAT NOT — AN INDICATION OF THE ACCURACY OF THE GAUGE. YOU MIGHT OR MIGHT NOT HAVE THE REMAINING FUEL SHOWN BY THE GAUGE.

There's only one way to accurately check the fuel quantity gauge. This calls for the gauge to be calibrated against a known quantity of fuel. Current maintenance procedures call for this to be done ONLY during each 6th periodic inspection, or when a fuel system component is changed. This means the aircraft may fly up to 450 hours without an accurate calibration of the fuel quantity gauge. Are YOU willing to trust the gauge that long? I hope not!

Be Seein' you —
G. Gus

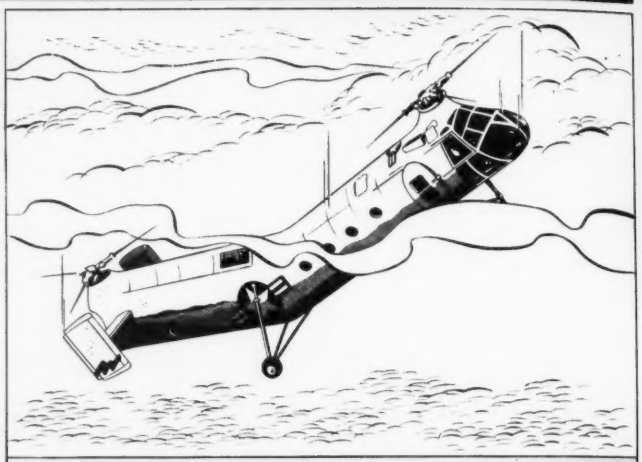
Editor's Note: A similar situation exists on all H-19Ds with serial numbers prior to 56-1557.

ASPHALT AIRWAY

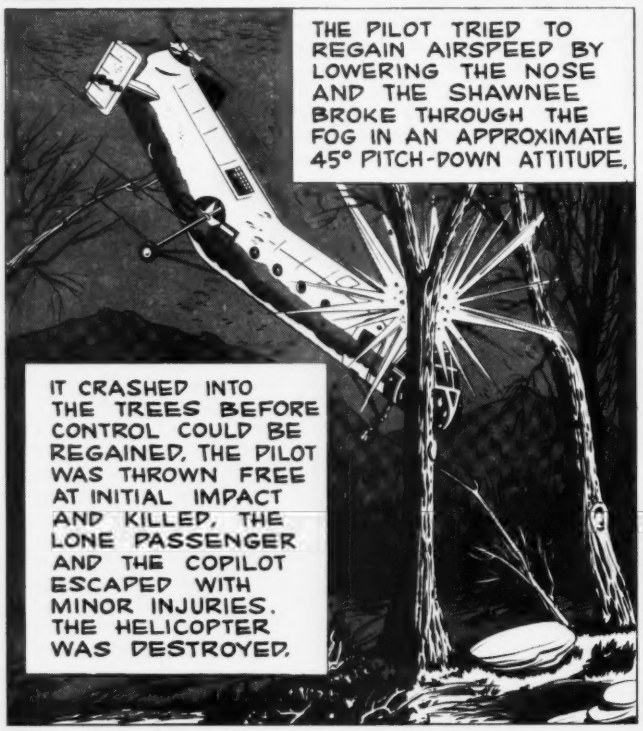
prepared by
THE U. S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

RETURNING FROM A SEARCH FOR A MISSING AIRCRAFT... A SHAWNEE FLEW UNDER A LOWERING CEILING TOWARD AN AREA OF REDUCED VISIBILITY.

THE PILOT ATTEMPTED TO PENETRATE THE IFR WEATHER BY FLYING LOW OVER A FAMILIAR HIGHWAY.



HE LOST SIGHT OF THE GROUND AND STARTED A CLIMBING 180° LEFT TURN, TRYING TO FLY CONTACT, HE BECAME DISORIENTED AND SHOUTED THAT HE HAD VERTIGO, THE COPILOT SPOTTED THE HIGHWAY AS THEY BROKE INTO THE CLEAR MOMENTARILY. HE TOOK CONTROL, COMPLETED THE TURN AND FLEW OVER THE HIGHWAY AT 200 FT. CONTROL WAS RETURNED TO THE PILOT AND THE 'COPTER ENTERED DENSE FOG AGAIN. HE TRIED TO CLIMB BY RAISING THE NOSE. THE AIRSPEED DROPPED TO ZERO AND THE H-21 BEGAN SLIPPING REARWARD.



THE PILOT TRIED TO REGAIN AIRSPEED BY LOWERING THE NOSE AND THE SHAWNEE BROKE THROUGH THE FOG IN AN APPROXIMATE 45° PITCH-DOWN ATTITUDE.

IT CRASHED INTO THE TREES BEFORE CONTROL COULD BE REGAINED. THE PILOT WAS THROWN FREE AT INITIAL IMPACT AND KILLED. THE LONE PASSENGER AND THE COPILOT ESCAPED WITH MINOR INJURIES. THE HELICOPTER WAS DESTROYED.

THE INVESTIGATION BOARD DID AN OUTSTANDING JOB. THESE WERE THE CAUSE FACTORS THEY FOUND: ONE- THE AIRCRAFT WAS FLOWN INTO IFR CONDITIONS AT LOW ALTITUDE WHILE OPERATING ON A VFR FLIGHT PLAN. TWO- FAULTY FLIGHT PLANNING WAS EVIDENCED BY OPERATION OUTSIDE THE LOCAL AREA WHILE ON A LOCAL FLIGHT PLAN AND FAILURE TO CHECK EN ROUTE, DESTINATION, AND FORECAST WEATHER PRIOR TO RETURN FLIGHT. THREE- FAILURE TO MONITOR FLIGHT INSTRUMENTS RESULTED IN CONFUSION, FAULTY CONTROL AND AN ATTITUDE FROM WHICH A CRASH WAS INEVITABLE!
BILL CARTER